

Results Positive For First Users

Ethernet Scores High At Transamerica Corp.

By Bruce Hoard
CW Staff

LOS ANGELES — The initial results from the first commercial Ethernet beta test site are positive, according to Transamerica Corp., which flipped the switch on the Xerox Corp. baseband local-area network at its building here March 4.

The multinational company began installing its 10M bit/sec system in January. "Basically, the installation was trivial," said Transamerica senior business consultant Zara Haimo. "It was done very easily and didn't cause any particular problems."

The Transamerica network was originally slated to employ 12 Xerox 860 word processing stations on two floors. That plan was altered when

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Installation Goes Easily, First 3081 Users Report

By Tom Henkel
CW Staff

IBM's 3081 processors are easy to install and problems can be diagnosed quickly, some first users of the top-of-the-line CPUs have reported. One user said the processor operates slightly better than IBM's announced performance claims; two others said their processors were too new to evaluate performance.

"We haven't had any real show-stoppers yet," Ray Stanley, director of operations at Martin Marietta Corp.'s Data Systems Division, said of problems with two recently installed 3081 Model Group D processors. The Orlando, Fla.-based division has installed two 16M-byte 3081 processors, which are running under MVS-SP Re-

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COMPUTERWORLD

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CW Photo by T. Scannell

Archie J. McGill, AT&T's vice-president of business marketing, gave the keynote address at the Data Processing Management Association's annual conference last week. Page 13.

CW At DPMA

Present realities and future prospects in DP management dominated discussion at the DPMA's annual conference last week. Among the highlights:

- Information networks will alter the way companies do business, according to a Yankee Group consultant. Page 14.
- One DBMS is often not enough — and some companies are installing them in pairs. Page 15.
- Programmer productivity has been at a virtual standstill for the last 20 years, a new study has found. Page 22.
- Corporate data centers are still vulnerable to computer abuse despite computer crime laws and electronic safeguards. Page 23.
- Artificial intelligence may simplify DP managers' jobs. Page 27.

Plans Photoconductor Switch IBM to Replace TNF-Bearing Units

By Bruce Hoard
CW Staff

IBM is removing the controversial, mutagenic and possibly carcinogenic trinitrofluorenone (TNF)-bearing photoconductors from the 3800 laser printer, 3896 tape-to-document converter, Copier and Copier II.

In exchange, customers will receive photoconductors similar to those used in the IBM Series III copiers and

6670 copier/duplicator. Said to last five times longer than their predecessors, these photoconductors will be completely retrofitted by the end of 1982, according to IBM.

The company denied that it is making the photoconductor exchange as a result of pressure from users. "We are making this change for business and technical reasons," an IBM spokesman said. "However, this con-

version should alleviate any remaining concerns our customers or employees may have about our use of TNF."

As it has in the past [CW, Sept. 8, 1980], IBM denied that TNF poses any threat to users or service personnel.

However, in tests conducted by IBM, TNF was found to cause harmful mutagenic, or biochemical, changes in mice. Further IBM studies turned up possibly carcinogenic tumors in laboratory animals injected with the substance.

Those tests were subsequently labeled "insufficient" by the Environmental Protection Agency.

In a letter dated Oct. 16 and sent to relevant customers, IBM said the chemical compounds in the new photoconductor have been thoroughly tested for toxicity and potency. (Continued on Page 8)

DOD Draws Fire for Failing To Cope With DP Problems

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — The Department of Defense is apparently unable or unwilling to resolve the information resources management problems besetting its military command and control DP systems — systems that are "essential elements of U.S. national security," according to congressional investigators.

Failure to adequately address these problems, first identified in 1970, has led to a "serious degradation" of DOD capabilities during the past 11 years, the General Accounting Office said in a recent report.

The report is another in a decade-long series by GAO on the World Wide Military Command and Control System. This latest study centered on the system's data processing program, known as the World Wide Military Command and Control Information System (WIS).

WIS is intended to provide the President and the Defense Department with the means to receive early warning and intelligence informa-

tion, direct military operations and communicate with the various military and civilian commands responsible for defense activities.

WIS consists of data communication. (Continued on Page 4)

Product Spotlight Supercomputer Popularity Grows

By Tom Henkel
CW Staff

The supercomputer business is booming.

Once viewed as machines reserved for government agencies willing to pay their multimillion-dollar price tags, supercomputers are beginning to make economic sense to commercial firms. Advances in graphics technology are making these processors attractive for a variety of design applications as well.

The term "supercomputer" generally refers to a very large processor capable of performing both scalar and

vector processing tasks. In short, supercomputers are big number-crunching machines that can process

This week in In Depth: Jack Worlton of Los Alamos National Laboratory explores "Supercomputers — The Philosophy Behind the Machines."

great quantities of statistical data extremely quickly and thus are used mainly for large-scale modeling and research applications.

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Trial Slated To End Jan. 22 In AT&T Case

WASHINGTON, D.C. — Judge Harold R. Greene has specified a new timetable for the remainder of the U.S. vs. AT&T antitrust trial. The new schedule is intended to close the trial record by Jan. 22 and enable Greene to render a decision by next summer.

To meet the new schedule, the trial will be in session five days a week from Nov. 30 to Dec. 18, the date by which AT&T is now expected to end presentation of its case. The trial will then be recessed until Jan. 11.

The government will take the next two weeks to try to rebut AT&T's orally presented evidence. Final briefs will be filed by both sides on March 15, proposed findings on April 2 and objections to findings April 30.

Under this schedule "the trial will have lasted approximately 11 months; post-trial briefing will consume an additional three months, and it is hoped that a decision can be reached and rendered within a three-month period after that," Greene said.

He added that if AT&T is not able to finish its case by Dec. 18, he will give them until Jan. 20 to do so, but the court, if necessary, to meet this deadline will operate on a five- or six-day basis after the Christmas recess.

Misinstructed CPUs Contribute To Delay of Space Shuttle Launch

KENNEDY SPACE CENTER, Fla. — A series of delays, ranging from misinstructed computers to a clogged oil filter last week, postponed and finally scrubbed the second launch of the space shuttle *Columbia*.

At press time, the lift-off and beginning of the spacecraft's five-day flight was rescheduled for later this week, according to National Aeronautics and Space Administration (Nasa) officials.

Problems with the shuttle began nine minutes before *Columbia*'s scheduled blast-off time, when the pressure dropped in the ship's internal and external liquid oxygen tanks. The countdown came to a halt. When launch officials instructed ground-based computers to override the problem, two of the Launch Processing System's Modular Computer

Systems, Inc. Model 11/45 computers accepted the commands and countdown resumed. However, a third did not and continued to send out warning signals to the *Columbia*.

At T minus 31 seconds, when the IBM shuttle's five on-board IBM Advanced System/4 Pi Model AP-101 computers took over the final steps of the countdown, the computers detected the warning signals from the ground-based system and correctly halted the launch. Apparently, *Columbia*'s crew did not have time to tell the computers to ignore the ground computer's warning signals, a Nasa spokesman said.

Later that morning, rising oil pressures in the *Columbia*'s hydraulic power generators, caused by a dirty oil filter, forced officials to cancel the launch.

First Bank Test of Videotex Set

MINNEAPOLIS — The first U.S. test of a "fully transactional" videotex system was announced here last week by First Bank Systems, Inc. (FBS). Utilizing France's Antiope technology, the test initially will involve 15 terminals in Fargo, N.D., but by next May "more than 250" are expected to be in place.

The test is reportedly the first in which a banking organization has decided to offer on its own a full

menu of videotex services rather than home banking alone. The group to be served by the system, which will be called Firsthand, consists almost entirely of "agribusiness."

Besides home banking, teleshopping and electronic games, Firsthand will provide agricultural bookkeeping services, weather, commodity and news reports. The latter will be provided by the Minneapolis *Star and Tribune*.

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Uses 2M-Byte Memory Boards

Stratus Brings Out 'Fail-Safe' 32-Bit System

By Tim Scannell
CW Staff

NATICK, Mass. — A hardware-based fail-safe computer system that uses a series of completely redundant parts to achieve continuous processing was introduced last week by Stratus Computer, Inc.

The Stratus/32 offers 25% greater performance than Tandem Computers, Inc.'s Non-Stop system — its primary competitor — and is roughly

equivalent to a Prime Computer, Inc. Model 750 or IBM 4341 Model Group 1 machine, Stratus claimed. In addition, the Stratus system is the first to use 2M-byte memory boards, a spokesman for the firm said.

The 32-bit system basically consists of a single processing unit that contains two CPUs, two memories and two controllers and peripherals. The system is designed so that when one portion fails, the duplicated part

takes over and continues the operations at the same speeds and performance levels.

Although the Stratus/32 competes against the Non-Stop, the system differs from the Tandem machine in that it has hardware- rather than software-based redundancy and because the dual parts are consistently working together processing the same data, explained William E. Foster, Stratus president.

Moreover, the Stratus/32 is actually two complete systems functioning as one while the Non-Stop consists of two identical computers linked by a peripheral switch.

The Stratus/32 can reportedly weather multiple hardware failures — of, for example, the system's memory, its disk drive and tape drive — and continue operating with no performance degradation. When the Stratus computer experiences a failure, the failed part discontinues service while the redundant twin continues processing the same information. If both parts fail, the processor will stop, then start up again when one of the bad parts is replaced.

In the Tandem configuration, spare parts are automatically switched over to replace failed parts. However, since the system is software-based, the software required to update the data between each computer twin is very complicated, Foster said. There is also a large performance loss because of the need to keep both computers updated, he added.

Finally, in typical redundant computer systems, the systems require special programming, so it is difficult to convert old applications or run applications that have been developed on other systems, Foster said. In the Stratus/32 design, however, no application or operating system software is involved in the system's redundancy, so programs developed on nonredundant systems can be converted to run on the Stratus, Foster claimed. Since both of the machine's processors are using identical data, there is no performance loss updating each separate machine.

Expansion Features

Features of the Stratus/32 include modular expandability from 18 to 1,024 processors and a self-checking system that relies upon the system's redundant architecture to check data input and output for consistency, providing every board in the system with the ability to check itself for errors 8 million times each second, Foster stated.

A single processing module can support up to 8M bytes of redundant memory, 64 terminals, two tape drives, up to 280M bytes of redundant disk storage and up to 2.3G bytes of storage on 16 external disk drives, Foster explained. In a 32-processor network, the system can support 256M bytes of memory, 73G bytes of disk storage, 2,048 terminals and 64 tape drives.

Software for the 32-bit system includes the Virtual Operating System (VOS), which allows every processing module in a network to act as one to the user; Cobol; Basic; and PL/I, the spokesman said.

A basic Stratus/32 system with 2M bytes of memory, two 33M-byte disk drives, a redundant tape drive, a CRT terminal, VOS and Cobol costs about \$135,000 — more than \$100,000 less than a similarly configured Tandem system, Foster stated. Additional memory costs an average of \$5,000 per 1M-byte, he added.

The firm is located at 17-19 Strathmore Road, Natick, Mass. 01760.

GAO Hits DOD Failure to Fix DP Snafus

(Continued from Page 1)

tions lines, an intercomputer network and hardware and software in a system providing real-time communications with common data formats and compatible system components.

DOD has accelerated efforts to upgrade its systems, but, according to a GAO analysis of recent progress, "these efforts are slow, do not address the fundamental issues and

will not lead to a timely, responsive solution to known WIS problems."

According to GAO, "DOD, despite dozens of large-scale studies, has failed to make meaningful progress toward implementing a responsive, reliable and survivable WIS. The performance of the current WIS suggests that rapid improvements are necessary to minimize shortfalls in capability, particularly during times of

crisis."

However, GAO said, "WIS modernization planning is proceeding far too slowly to be responsive to these deficiencies."

Several Problems

The study noted several problems with DOD efforts, especially failure to establish effective central management for WIS. In addition, GAO complained that the Defense Department has "prematurely selected a computer architecture before defining requirements which relies on advances in computer technology beyond the existing state of the art."

Specifically, GAO said, DOD is relying on cable bus architecture for use at future WIS sites to interface several major computer systems, including existing mainframes, proposed WIS standard mainframes, a data base machine system, network front ends and automated message handling systems.

However, GAO said, "the applicability of such an approach cannot be made objectively and requires significant technological advances in the state of the art."

According to GAO's analysis of existing cable bus architecture, "significant advances will be required before cable bus technology can be of practical worth in the command center. We were unable," GAO added, "to determine when this development would occur, if at all."

"The development may also be superseded by other advances, such as improved message switch architectures, which may become commercially available at significantly reduced costs," the GAO analysis continued.

In general, GAO said, DOD plans to modernize WIS have "a fragile foundation" and do not provide timely solutions to current problems. The study called for "substantial changes" to the WIS modernization efforts.

Among other things, GAO recommended that DOD:

- Replace "those computer systems having immediate shortfalls with modern, upward-compatible computers where a comparative costs analysis justifies such action."
- Develop an architecture and computer systems employing proven state-of-the-art technology.

GAO noted DOD generally did not agree with the study's findings and recommendations. But, GAO commented, DOD "did not provide any new or convincing evidence to support its objections."

United Telecom, Tymnet Wrangle Over Isacomm DTS Application

WASHINGTON, D.C. — United Telecommunications, Inc. has locked horns with Tymnet, Inc. over the latter's insistence that the Federal Communications Commission (FCC) decide whether to let telephone carriers offer the wideband, digital local-loop facilities known as digital termination services (DTS).

The nub of the dispute is an earlier application by ISA Communication Services (Isacomm) for a DTS license; Isacomm is about to become a United Telecom subsidiary. Tymnet, which wants the Isacomm application delayed until the carrier entry question is settled, has requested a license to offer DTS in many of the same cities targeted by Isacomm.

"There has been no showing of anticompetitive conduct or intent on the part of United Telecom or its operating entities," the telephone carrier said, "nor do they possess market

power to permit such abuses. Furthermore, the proposed separated corporate structure and nondiscriminatory interconnection arrangements would preclude any alleged abuses."

Meanwhile, another DTS applicant, National Microwave Interconnect Co. (Nmic), has asked the FCC to "clarify" how it will deal with the fact that there are now more applicants for DTS channels than can be accommodated within the allocated bandwidth.

Actually, only some of the channels are being sought by more than one applicant. Tymnet, Inc., Isacomm, and Satellite Business Systems (SBS) have no rivals, Nmic's recent petition said. The commission could, as a result, give licenses to these three applicants while forcing the others to wait while it resolves the question of those seeking the same channels.

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House Report Wary About Bell Deregulation

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C. — There is still not enough competition in the telecommunications industry to support the kind of deregulation favored by AT&T and the rest of the telephone industry, a 700-page report issued here last week by the staff of the House Telecommunications Subcommittee maintains.

The report, which also criticizes policies advocated by both the Reagan Administration and the Federal Communications Commission (FCC), will play a key role in shaping a new communications bill that the subcommittee will begin drafting immediately, according to Subcommittee Chairman Tim Wirth (D-Colo.). The House bill, based on what is in the report, is likely to differ markedly from S. 898, the measure passed recently in the Senate.

S. 898 directs the FCC to establish "a plan ... to foster marketplace competition to implement deregulation." Telecommunications services offered by regulated carriers are "subject to effective competition" if one or more competitors offer "a reasonably available alternative."

In its report, the House Telecommunications Subcommittee staff concluded that while allowing AT&T "to enter new markets like computers poses serious threats to anticompetitive behavior, we believe the critical national interest in developing the technologies of both computers and the communications links between them outweighs the risks." However, it believes "the telecommunications industry is in transition from monopoly and/or scarcity to a competitive environment [and the] transition is far from complete."

"In many markets, the full force of competition ... has yet to develop to the point where complete deregulation will further the public interest. In such cases, deregulation could well result in the re-emergence of monopoly supply without government safeguards."

Defines 'Competitive'

One of the report's key points was that "'open to competition' is not the same as 'competitive.' Mere entrance of competitors has never been held ... to create a market in which free enterprise, rather than one or a few dominant firms, will dictate price or service."

The fact that a market is "not fully competitive does not mean that all suppliers within that market should continue to be regulated." It "makes as little sense" to regulate a supplier without market power as it does to deregulate the dominant suppliers.

In summary, the subcommittee report made the following points about competition in specific markets:

- Long-distance services. Facilities must remain regulated, but on-line information offerings and other "enhanced" services should be deregulated. AT&T should be allowed to offer enhanced services provided it does so through an adequately separated subsidiary.
- Communications equipment. Although the terminal equipment market is more competitive than the one for telephone central office equip-

ment, carriers still wield undue influence in some areas. A huge installed base gives them an edge in selling replacement equipment and, in some cases, Bell's "installed base migration strategy" has locked in its customers.

Rather than completely deregulating the terminal equipment business, as specified in S. 898, the report states the House subcommittee "should consider the various segments of telecommunications equipment separately and permit the broadest possible removal of regulation, while still providing protection for users' interests and the means for an orderly transition to full competition."

- Local distribution. New, special-

ized services are developing, but universal local exchange will remain a telephone monopoly "for the foreseeable future." One major policy issue is how to prevent local telephone companies from using their monopoly control over these "bottleneck" facilities "as a tool to forestall the development of competition in adjoining markets."

• On-line services. This market is highly competitive at the moment, but whether it remains that way depends on the terms of AT&T's entry and on retention of a clear separation between regulated and enhanced services.

The report included a number of unflattering references to the FCC, and Wirth added to them at a press

conference called to discuss the document. The FCC, he said, has devoted too much attention to deregulation and not enough to promoting competition, and it has not paid enough attention to the wishes of Congress.

Wirth said a first draft of the House communications bill should be published by the end of this month. He expects subcommittee hearings to begin in February and markup to occur in March with passage by the full House taking place by the end of May. The next major step would be a conference with the Senate to work out differences between the House measure and S. 898. "By July 4, we hope to have a new communications act on the President's desk."

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Wang Enhances, Adds Options to Existing Products

By Ann Dooley

CW Staff

LOWELL, Mass. — Together with its introduction of the Alliance 250 office information system, Wang Laboratories, Inc. announced options and enhancements for its existing product line. These include:

- The ergonomically designed Audio Workstation, which offers voice messaging and dictation.
- Remote and local communications capabilities and 2200 data entry emulation for the Wangwriter.
- A capability allowing VS superminis, OIS 140/145 workstations and Alliance 250 workstations to attach to Wangnet broadband cable.
- An Image Transfer System.
- Increased main memory capacity for the VS100 superminicomputer.

Support Available

Debuting in conjunction with Alliance, the audio option provides voice messaging and is available on Model 5320- and 5340 workstations. Professional support functions, WP, dictation and voice messaging functions are featured.

When used with Alliance data base software, it provides an automatic dialing function from an automated phone directory, according to a spokesman.

Wang also added enhancements to the Wangwriter to connect it either locally or remotely with the 2200 series LVP or MVP small business minicomputer, providing access to those series' DP and communications capabilities so that the stand-alone Wangwriter can operate as an interactive terminal on the 2200 to perform WP/DP tasks.

It can also be linked to large VS superminicomputers or interact with a host mainframe, according to the spokesman.

VS superminis, OIS 140/145 and Alliance 250 workstations can now attach directly to the Wangnet broadband cable, as can all VS, OIS and Al-

liance printers, workstations and serial devices through a Wangnet multiplexer. The remote Wangnet facility now allows OIS, VS, 2200 workstations and the Wangwriter to remotely connect to the VS computer, a spokesman noted.

The Image Transfer System is a peripheral device to the OIS, Alliance and VS systems that can be used as an alternative to facsimile group III sys-

tems and operates a scanning device that digitizes any kind of document for storage on a Wang system.

Finally, VS 100 main memory has been expanded up to 8M bytes. All VS systems can be field upgraded to use the new option, Wang said.

The Audio workstation costs approximately \$6,200. Available next May, the Image Transfer System will cost an estimated \$15,495. Wangnet

options for the ergonomically designed workstations are \$600 and \$500 for existing OIS and Alliance systems.

The terminal emulator software and communications controller will cost \$200 each and the new, full-functioned Wangwriter will be available in the spring of 1982, Wang said from One Industrial Ave., Lowell, Mass. 01851.

Ethernet Scores High on Commercial Test

(Continued from Page 1)

one department switched floors and another department asked to join the test.

Coaxial cable was laid on three floors instead of two and the number of Model 860s increased to 15. Additional cabling was done without interruption of the system.

One of the network's first crises occurred when a violent electrical storm knocked out power in Los Angeles. How much of a problem did that pose? "No more than having your lights go out," Haimo reported.

Data in transit at the time of the outage was not lost because the software-loaded file server, which controls network capacity, aborted those messages and then automatically retransmitted them when power was restored.

Not Problem-Free

The first commercial Ethernet installation has not been problem-free, however. What Haimo referred to as the "pre-pre-release of software" first used in the file server was so loaded with "traps, outs and tracers" that the number of 860s that could log on to the system was limited to three.

Haimo stressed that the software was experimental and not destined for commercial usage, adding that Xerox has continually provided newer versions that allow more users

to access the network.

Haimo is concerned that the next version, due anytime, will once again limit logging access to the system.

Ethernet uses carrier sense multiple access with collision detection as a means of accessing the network. Using this method, the interface unit for each workstation checks the network to see if any other station is transmitting. If not, the station sends its message. In the event another station starts transmitting simultaneously, the messages may collide in the network and each station must wait a random period of time before retransmitting.

Although Xerox has implemented several experimental 3M bit/sec systems at its own sites, the system at Transamerica is one of the first 10M bit/sec networks to be installed. Sixteen others are currently in place, but Transamerica is the first to go public with its results. Xerox would

not release names of other beta test users. As far as diagnostics are concerned, Haimo said Transamerica is looking at the network from a business standpoint and is not primarily concerned with technical aspects.

Xerox, which had technical people at the site, refused to divulge such performance parameters as throughput variance, mean and median packet lengths and possible message degradation at high-capacity transmission levels. The company said diagnostic information was available in literature written for Xerox by John F. Shoch and Jon A. Hupp. Shoch and Hupp performed their tests on an experimental internal 3M bit/sec Ethernet. The Transamerica Ethernet is a 10M bit/sec system.

A spokesman said Xerox was not worried about high-capacity message degradation because earlier tests showed the network to be impervious to such problems.

FCC Proposes Setting Aside Seven VBI Lines for Teletext

WASHINGTON, D.C. — A proposal to set aside seven lines of the vertical blanking interval (VBI) — the gap separating adjacent frames of a commercial TV signal — for teletext has been unveiled by the Federal Com-

munications Commission (FCC).

A Notice of Proposed Rulemaking, to be issued shortly, will ask interested parties to comment on the specific VBI lines chosen (14 to 18, 20 and 21) and some related matters, according to a spokesman.

However, the commission apparently does not intend to become embroiled in the controversy over fixed vs. variable and synchronous vs. asynchronous transmission systems.

The British have proposed a fixed synchronous scheme as a U.S. standard, while a consortium led by Columbia Broadcasting System (CBS) — and including France and Canada, plus the silent support of AT&T — is promoting a variable, asynchronous transmission format.

FCC Commissioner Mimi Weyforth Dawson alluded to the controversy when she said recently, "The citizens of this country will not, by this decision, be limited to a single system and thus will have the opportunity to respond to any service a provider may wish to make available."

Correction

John Landry of McCormack & Dodge was quoted as mentioning Micro-See and the MDDBS data base for micros from International Data Base Systems, Inc. [CW, Nov. 2]. MDDBS was actually developed by Micro Data Base Systems, Inc.



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Offers Data/Word/Audio Processing

Wang Takes Wraps Off Alliance Office System

By Ann Dooley

CW Staff

LOWELL, Mass. — In a sweeping series of introductions last week, Wang Laboratories, Inc. unveiled its long-awaited Alliance office information system as well as enhancements to its existing product line (story on Page 6).

The Alliance 250 system allows non-DPers at all levels of an organization to create a data base and then to retrieve and format information instantly, according to a Wang spokesman. The impetus behind the Alliance was to provide data/word/audio and image processing and networking, all within one highly integrated package, he said.

The Alliance information base indexes all documents and also permits document retrieval using as the selection criteria any word or group of words that appear in the document. The information base compresses information stored in the index so that it indexes all words in all documents with an average disk space overload of only 8% to 15%.

System Features

Free-form text and structured records are featured on the system, as is variable field length. Four information management capabilities are featured:

- **Visual memory:** a data base application that handles data and word processing text in which a user can structure, categorize, access and manage groups of information on a "visual" basis.

- **Document Management:** an "electronic file cabinet" that allows the user to retrieve any on- or off-line document by specifying any word or words located in the text. Alliance corrects spelling from an 80,000 word dictionary and also checks dictation, analyzing the complexity of any document entered and suggests the most readable format.

- **Time Management:** includes calendar management that can be automatically coordinated with the schedules of other employees and a things-to-do list.

- **Message System:** includes message index, signaling of messages, an electronic "in-basket" for storage and display of text messages, a textual phone message and a quick message function for the transfer of short notes. Word processing documents can also be sent through the Message System.

Local communications with other Wang equipment can be accomplished through

Wangnet or the Wang Inter-System Exchange (Wise); shared-resource remote networking is offered between all Alliance, OIS, 140/145, 2200, Wangwriter and VS systems using the Remote Wangnet facility and for remote communications to mainframe computers, a 3270, 2780/3780, 2741 or TTY device emulation can be uti-

lized, Wang noted.

The basic configuration of the Alliance 250 includes a master processor with a diskette drive for off-line storage, 32 ports, operating system software and 128K bytes of memory. At least one 80.4M-byte fixed/removable drive is needed, and a variety of CRT-based workstations and printers, all with 64K

bytes of memory, can be attached.

The basic Alliance 250 system costs \$19,000 and the primary 80.4M-byte disk drive is priced at \$19,000. WP, document management, spelling verifier, advanced editing functions, decision processing enhancement, systemwide glossaries and resource management soft-

ware are included.

Optional Alliance 250 software includes a visual memory function costing \$6,000, time management costing \$2,000. The license fee for CP/M is \$1,000, Alliance Basic costs \$3,000 and the voice option costs \$2,000. Wang's worldwide headquarters is at One Industrial Ave., Lowell, Mass. 01851.

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- Abend-Aid will pay for itself in less than 6 months in most environments — large shops in less than 1 month.
- Abend-Aid is the only product ever offered which uses the power of the computer to analyze and debug abends for all languages.

NO

- Abend-Aid is not a dump formatting package.
- Abend-Aid does not require any JCL changes.
- Abend-Aid does not require any modification to IBM code.
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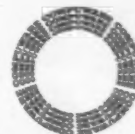


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IBM Replaces TNF-Bearing Photoconductors

(Continued from Page 1)

tial mutagenicity and carcinogenicity. "All test results were favorable," the letter assured users.

The IBM spokesman described eight tests performed on the two chemicals that will supplant the charge transfer function performed by TNF. The chemicals are chlorotiane blue and diethylaminobenzaldehyde-dithenylhydrazone (DEH).

Other chemicals in the new photoconductors include aluminized polyethylene terephthalate, polyester, polyacrylic, polycarbonate and polydimethylsiloxane.

Independent Testing

The tests were performed by an outside scientific testing laboratory, the name of which IBM would not divulge. They included acute oral and dermal tests, skin and eye irritation tests and the Ames test, a quick procedure designed to determine if chemicals are mutagenic, according to IBM.

The spokesman said air emission tests on the two main chemicals in the Series III-style photoconductors turned up "nondetectable" amounts of the substances.

IBM's letter to its customers noted that IBM performed "a recent series of animal tests" on TNF. Those tests were conducted by IBM scientists and outside sources that IBM also refused to identify.

Users were told the photoconductor exchanges will be made by IBM field service representatives starting in December. They will take approximately seven hours on the 3800 and three hours for the 3896.

Field service representatives started wearing protective gloves after learning of possible health hazards associated with TNF. According to the IBM letter, those working on the 3800 and 3896 will continue to wear gloves for 60 days after the new photoconductors are retrofitted to ensure against contamination by any residual TNF. Copier and Copier II technicians will cease wearing gloves immediately.

In another change of policy, the field representatives will no longer pick up used photoconductors for

IBM Gives Up on Fixed-Head 3380s

By Tom Henkel

CW Staff

WHITE PLAINS, N.Y. — IBM has tossed in the towel on the two fixed-head models of its 3380 disk drive.

The company last week confirmed that it has withdrawn plans to offer the disk drives because the proposed solution to the technical problem that delayed their production for seven months does not work on the fixed-head version.

Fixed-head disk drives set aside a limited amount of virtual storage that can be accessed essentially immediately. When IBM announced a delay in delivering its 2G-byte 3380 disk drives in March, it offered users with ordered fixed-head 3380s the option to change to the removable-head versions without jeopardizing their position in the delivery schedule.

The two models withdrawn are the 3380 A4F and the 3380 B4F. IBM said it still offers a fixed-head version of its 3350 drives, which can be used as an alternative. It takes four single-density 3350s to equal the capacity

of one 3380, however.

IBM also said its cache management models of the 3880 storage control unit can be used to provide almost immediate access to specified data. There are also several IBM program products available to speed up access to specific blocks of data, a spokesman said.

Analysts said the withdrawal probably came as a relief to IBM. Fixed-head disk drives have traditionally not sold as well as the removable-head versions. In the past, IBM, as well as the plug-compatible manufacturers (PCM), has reportedly often run into problems trying to estimate how many fixed- and removable-head drives to manufacture. At times, IBM, as well as the PCMs, has reportedly wound up sending fixed-head drives back to the factory to be converted.

In addition, one industry observer noted the amount of storage that can be instantly accessed by a fixed-head device (5.6M bytes, or 1.6M bytes per actuator) is almost insignificant compared with the 3380's 2G-byte capacity.

disposal, the spokesman said.

Asked what IBM would do with surplus TNF and TNF-bearing photoconductors, the spokesman said, "Any TNF material we must dispose of will be incinerated under properly controlled conditions."

The new photoconductor has four layers instead of one, the spokesman said. However, it is similar enough to the Series III version to be made on the same assembly line at IBM's Boulder, Colo., manufacturing facility.

The new device has been installed in all 3800s, 3896s, Copiers and Copier IIs shipped since Nov. 1. IBM considered the change for "years," but "it was not technically feasible to use a single type of photoconductor before this time," the spokesman said.

First 3081 Users Report Few Problems

(Continued from Page 1)

lease 1.1; eight to nine additional processors are expected by the end of the year.

Conversion from a 3033 to the 3081 environment went smoothly, Stanley said, but minor delays were caused because it had to install IBM software fixes.

The Data Systems Division is a service bureau that handles internal Martin Marietta accounts as well as about 400 commercial users. Operators underwent some retraining for the 3081, but most were quick to pick up on some different formats for using the processor, according to Stanley.

McDonnell Douglas Automation Co. (McAuto) installed a 3081 processor at its St. Louis facility about two weeks ago. The system was installed

and put into a production mode in about three days and has been running ever since, according to Computer Operations Director John Gehrin.

The giant service bureau has yet to encounter a problem with the 16M-byte system, which is running as a JES3 global system governing three 3033 processors under the MVS-SP operating system with TSO and IMS, Gehrin said.

McAuto has several 3380 disk drives, but they are still in a test environment and not attached to the 3081. The firm is using 3350 disk drives on that system, according to the operations director

properly.

While Stanley said his firm experienced some compatibility problems in using the 3380 with the smaller 3033 processors, he noted that the problem may be Martin Marietta's and not IBM's. The other two 3380 users did not report similar problems.

Proposal Backs Science, Tech Ed

WASHINGTON, D.C. — A federally sponsored program to encourage science and technology education programs was proposed in Congress recently by Rep. Doug Barnard (D-Ga.).

The Oct. 20 resolution calls for a National Science Center for Communications and Electronics to "promote the interests of the public at large in science and technology and tie the academic, corporate and government worlds together in an effort to increase interest and educational opportunities in those fields."

The proposal noted the U.S. "dwindling" technological superiority and the need to ensure a "continuous flow of individuals trained and knowledgeable in science and technology."

The resolution also said "the fields of electronics and communications are at the core of advancing technology and the industries concerned with them employ more personnel than any other industries."

Therefore, it said, "it is in the best interest of the United States to encourage the public and private sectors to provide students at all educational levels with opportunities to visit and/or work in nonacademic environments as part of the curriculum."

Stanford Lab

The DP manager of one of the earliest users of a 3081, Stanford Linear Acceleration Laboratory in Menlo Park, Calif., said the processor has been performing at about four times the throughput of a 370/168 under the VM/CMS operating system. The processor averages about 12 million to 12.5 million instructions per second (Mips), slightly better than IBM's announced 10 Mips relative performance on the system, Chuck Dickens reported.

The 3081 has gone down four times since last January, but each time because of a minor problem, according to Dickens. None of the Thermal Conduction Modules (TCM), new with the 3081, has developed a problem, he added.

Martin Marietta was not as fortunate. However, when a TCM did fail, the 3081's diagnostic features helped identify the defective unit, Stanley said.

Besides being one of the first 3081 users, Stanley's division is also one of the first users of IBM's 3380 disk drives. Stanley, as well as the other two 3081 users, said the drives work

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But Congress Still Uneasy

FBI Encouraged by Crime File Decentralization

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — A pilot project to decentralize the Federal Bureau of Investigation's computerized criminal history files has had encouraging results, the bureau said recently, but a congressional oversight committee continued to express fear that the program may jeopardize personal privacy.

The FBI is now evaluating the first phase of its still experimental Interstate Identification Index (III) program. "Based on progress to date, III continues to represent a sound alternative to centralization of computerized criminal histories," according to Assistant FBI Director William A. Bayse.

Bayse, head of the FBI Technical Services Division, reported on the III project at a recent hearing of the House of Representatives Subcommittee on Civil and Constitutional Rights. Subcommittee Chairman Don Edwards (D-Calif.) said Congress still has not decided to what extent the FBI should be involved in interstate exchange of criminal justice data.

Trouble for FBI

Longstanding privacy and federalism questions have hindered FBI development of a nationwide data exchange system for more than a decade. Earlier proposals for a federally maintained computerized criminal history system were never successfully implemented for those reasons and because of limited state participation.

Under the III proposal, the FBI's National Crime Information Center (NCIC) would maintain an index to the individual states' criminal records.

The FBI would not maintain those records itself and the states would exchange records through a DP/telecommunications network not controlled by the federal government [CW, Aug. 24].

Better Privacy, But...

Edwards said the proposed system seems to offer better privacy protection than a centralized FBI system. But he said the subcommittee is disturbed by the fact that, under the current III proposal, requests from authorized criminal justice agencies around the country for state criminal records would go through the NCIC, which maintains a log of those inquiries.

The subcommittee's concern centered on the fact that the inquiry log would not include the results of those inquiries. It would show the names of people who were the subject of inquiries with no information on whether the inquiries found those persons to have criminal records or what the requested records showed.

"This massive record of inquiries [from] all over the United States" is going to pose a problem, according to Edwards. "People are going to say that in Washington you have a record of inquiries of [people] who might not even have been guilty of anything."

Bayse told the subcommittee the inquiry log is for administrative purposes only and would be closely secured. Stating "we understand that a criminal history was released sometimes improperly [in the past]," he said the present setup "isn't part of any surveillance scenario."

The subcommittee also raised several questions about a recent congressional Office of Technology (OTA) study of NCIC that suggested the present FBI and state criminal history system has considerable record quality problems [CW, Sept. 7].

"There is some type of glaring problems on the type of information that is currently being provided," ac-

cording to subcommittee counsel Michael Tucevich, who said "having records transmitted quickly is not important if those records that are transmitted are inaccurate."

But according to Bayse, the OTA report contained "outdated statistical and survey information and significant factual inaccuracies."

He said the FBI is analyzing the study and will document its objections to it when the upcoming final draft of the report is available.

National Center

Turning to another subject concerning NCIC, Tucevich suggested that perhaps with federal funding,

the states could establish and run a national criminal history index and record exchange system. This, he said, would end fears about FBI control over that system.

"That is a very powerful position to place anybody in," Tucevich said, "and I am not saying the FBI would [abuse] that, but someone should be worried about someone who might be tempted to do that."

At Tucevich's request, Bayse assured the subcommittee the FBI will not proceed to the next phase of III implementation until both houses of Congress evaluate the initial pilot project and expressly approve additional program development.

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"IT PAYS TO HAVE THE RIGHT CONNECTIONS"

Judge Overturns Verdict in DG Antitrust Case

By Robert Batt

CW West Coast Bureau

SAN FRANCISCO — In a dramatic reversal of a jury verdict, Data General Corp. has been cleared of antitrust charges brought by Fairchild Camera and Instrument Corp. and Digidyne Corp.

U.S. District Judge William Orrick overturned the June verdict that found the mini maker guilty of anti-competitive practices after a 45-day trial. The plaintiffs in the three-year-old case had charged that DG, by refusing to sell its RDOS operating system software separately from its Nova line of computers, allegedly locked in its users to DG equipment. The jury upheld Fairchild's and Digidyne's allegations, and the plaintiffs

pressed for a trial on the issue of damages. However, DG countered with a motion asking Orrick, who presided at the trial, to dismiss the jury verdict.

Central Issue

In his judgment favoring DG, Orrick said the central issue was whether DG possessed sufficient economic power to restrain competition, and "the Court finds that the jury verdict cannot stand because the evidence in this case does not support a finding of sufficient economic power appreciably to restrain competition."

Orrick argued that evidence showed that DG's customers are not sufficiently insulated from competition in the broad market to enable

the company to impose discriminatory prices or terms upon them. "The evidence unmistakably shows that DG's prices are competitive and that DG cannot exploit the supposed advantages of software lock-in because lock-in does not free it from the price constraints of the general market," Greene said.

Orrick ruled that the evidence did not support the plaintiffs' claims that legal barriers in the form of copyright notices and trade secrets protection, as well as economic barriers, deterred competitors from developing comparable software. "Fairchild's own development of Nova-compatible software and testimony indicating that Fairchild could add to that software all of the desirable fea-

tures of RDOS confirms the absence of significant economic barriers," he added.

According to Orrick, Fairchild and Digidyne did not demonstrate that competitors provided viable alternatives for customers who ultimately purchased Novas. "Fundamentally, plaintiffs have not presented evidence demonstrating that their alleged inability to compete with DG's Nova is attributable to the software licensing restrictions rather than to their failure to meet the standards set by DG with regard to such factors as the quality of the CPUs, the level of field service available, the ability to provide single-vendor accountability and marketing strategies," he said.

The latest verdict, if it is left standing, could have a significant impact on the market. Other companies that manufacture Nova emulators include Ampex Corp., Lear-Siegler, Inc., Point Four Data Corp., Nixdorf Computer Corp. and Keronix Corp.

In a terse statement following the decision, Fairchild said it intends to appeal Orrick's decision "at the earliest possible date."

"Legal counsel and the company are confident that the decision will be referred and the jury decision reinstated. In the meantime, Fairchild intends to aggressively market its 9445 family of microprocessors without DG's operating software system," the statement said.

Court Backs ROM Copyright

WOBURN, Mass. — A program embodied in a read-only memory (ROM) chip can be protected under the 1976 Copyright Act, according to a decision rendered by the federal court in San Francisco.

The case, which is still pending, was brought by Tandy Corp. against Personal Micro Computers, Inc. in early 1981. Tandy charged that the defendants copied a compiler program from Tandy's Radio Shack TRS-80, and altered and used the program for its own personal computer, the PMC-80.

The court's decision at the end of August involved whether the program, which was stored on a ROM chip that is permanently wired into the computer, warrants protection under federal copyright law.

The defendants filed a motion to have the case dismissed on the grounds that the ROM was uncopyrightable, but the presiding judge denied their effort. He determined that the 1975 Copyright Act, which became effective in January 1978, says that "works of authorship" can be copyrighted if they can be fixed in "any tangible medium of expression, now known or later discovered, from which they can be perceived, reproduced or otherwise communicated, either directly or with the aid of a machine or device."

The judge further ruled that under Sections 101 and 102 of the act, a computer program is a "work of authorship" that is subject to copyright, and a silicon chip is "a tangible medium of expression" within the meaning of copyright law.

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Hosts Meeting for Independents

IBM Goes Hunting for Applications Software

By Marcia Blumenthal

CW Staff

WHITE PLAINS, N.Y. — Need applications software? So does IBM — especially for its 4331, 8100, Series/1, System/38 and Personal Computer.

In a giant first step toward filling what some see as holes in its applications offerings for these and other systems, IBM hosted a three-day meeting here late last month for about 115 independent software companies. The mainframer paraded out some of its top brass to convince the independents to develop applications software for the smaller IBM systems.

During the meeting, IBM announced that it would allow a user to run an independent software maker's product on a specific IBM system at one of its demonstration centers if the user made such a request in writing, according to Max Eveleth, president of Urban Data Processing, Inc., one of the software companies represented at the meeting.

In addition, IBM urged the independent vendors to develop applications for its Small System Executive (SSX), noted John Inlay, president of Management Science America, Inc. SSX, a stable operating system that falls under IBM's program request for purchase quotation plan, reportedly reduces the need for programmers and operators for the 4331.

IBM also detailed its Installed User Program, a means of marketing application software developed by users. IBM suggested this program as a market route for independents, but one vendor said he got the impression that none of the companies present were interested in involving their products in that program.

Some Strategies Discussed

In the course of the three-day meeting, various IBM product managers discussed the firm's strategies for specific products. In particular, the firm reiterated its commitment to the 8100, a system in which IBM has already invested \$300 million, another vendor present at the meeting reported.

Besides the 4331 and 8100, IBM gave detailed explanations of its Series/1 and IBM Personal Computer as well as on other topics such as Systems Network Architecture. Although no specific presentation was made on the System/38, IBM stressed it was looking for software for this product as well.

In addition to product managers, several high-level IBM executives addressed the gathering. Among them were Francis G. "Buck" Rodgers, vice-president of marketing; George Conrades, president of the Data Processing Division; David Hanna, vice-president of market development; and Mitchell Watson Jr., president of the Systems Product Division.

The meeting dovetailed with IBM's announcement early in October that its General Systems Division would consider externally developed software for possible marketing by the division on a nonexclusive basis [CW, Oct. 5].

"Before it would never have oc-

curred to me to call IBM to discuss the potential of a product, now I would," Eveleth noted. IBM seems to have acknowledged the reality of the marketplace — that it "can't build the code for every machine."

Vendors interviewed by *Computerworld* shortly after the meeting said IBMers attending the meeting were very open and there was a lot of exchanging of telephone numbers. IBM indicated that the recent meeting was just the first of many to come.

IBM seemed "a little bit uncomfortable talking to the independents because its level of expertise on applications is not as great as ours,"

Maurice Giguere, vice-president of corporate development at McCormack & Dodge Corp., observed.

"The bottom line is that IBM is ready to deal," Sandra Kurtzig, president of Ask Computer Systems, Inc., remarked. At the meeting, IBM offered substantial volume discounts of 15% or more on hardware to software vendors who wanted to package hardware and software products. IBM also described possible programs for vendors whereby it would fund conversion from another hardware vendor's system to an IBM system or pay vendors to develop specific applications on a contractual basis, vendors reported.

Kurtzig's company packages a manufacturing system on Hewlett-Packard Co.'s HP 3000. "But whenever IBM with all its implied power makes a bid for doing a joint venture or cooperative arrangement you really have to think about it," she said.

Although IBM appears interested in acquiring software, it is primarily interested in filling up the boxes so it can move more hardware, one software vendor attending the meeting claimed.

"Our goal is to leverage more software. The extent that IBM and software vendors can mutually meet their goals will dictate the success of any cooperative program," he said.

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Justice Wants FCC to Reconsider 'Computer II'

By Phil Hirsch

CW Washington Bureau

WASHINGTON, D.C.— Although the Federal Communications Commission's (FCC) Second Computer Inquiry decision recognizes that allowing AT&T to offer unregulated services through a separate subsidiary is risky, it fails to provide adequate safeguards.

That was the key argument of the Department of Justice last week in a brief submitted to the U.S. Circuit Court of Appeals here. Justice wants the court to send the "Computer II" decision back to the FCC for reconsideration.

The "crucial question," according to Justice, is whether the separate subsidiary will diminish AT&T's in-

centives to shift costs from its competitive to its regulated services.

At roughly the same time, the staff of the House of Representatives Telecommunications Subcommittee was releasing a report that asked the same basic question and came to essentially the same conclusion: The separate subsidiary, as structured by the FCC, is a weak reed on which to lean (see story on Page 5).

Separate Subsidiary Argument

In the Computer II decision, the commission insisted that its separate subsidiary approach would reduce AT&T's cross-subsidy incentives because cost-sharing would be reduced and accounting records would track the monetary flows between the two entities.

However, the decision allows AT&T and its separate subsidiary to engage in joint manufacturing, research and development (R&D), purchasing, personnel recruitment and management and financing, the brief stated. It then quoted a recent FCC decision admitting that "no... system [for allocating AT&T's costs to the individual services it provides] is practicable with the resources available to us."

The brief also contends that:

- The commission recognized that the license contract arrangements between AT&T and its affiliates present a potential for cross-subsidies through misallocation of R&D costs. But investigation of these contracts was deferred until after implementation of the Computer II decision.

- The Computer II decision bars the separate subsidiary from getting inside information from the regulated side about technical changes to the network ahead of competitors, but does not prevent this information from being given exclusively to Western Electric Co. The result, according to Justice, is that Western Electric could develop new terminals to complement network enhancements before other manufacturers could come up with competing products.

- The decision requires the subsidiary to obtain services from its parent pursuant to tariff, but allegedly fails to recognize that these tariffs may be controlled by state rather than federal agencies.

- The decision assumes that if the separate subsidiary scheme does not work, the commission — under its authority to regulate services "ancillary to communications" — can regulate the subsidiary's non-common carrier activities. "The commission simply does not possess" this power, according to the Justice Department.

The FCC will almost certainly address these charges in a brief due Nov. 20. Fifteen days later, AT&T and others who support the Computer II decision will file statements. On Dec. 21, the Computer and Communications Industry Association and seven other petitioners opposing the decision will file reply briefs. That should close the written record. Oral argument is scheduled in January.

FCC Commissioner Defends Separate Subsidiary Structure

By Phil Hirsch

CW Washington Bureau

BOSTON — Federal Communications Commission (FCC) Commissioner Anne P. Jones last week struck back at critics of her agency who charge that the separated subsidiary structure mandated in the FCC's Second Computer Inquiry Decision would not curb AT&T's anticompetitive tendencies.

The FCC realizes the "separate sub" structure is not yet perfected, Jones said in a speech here before the Information Industry Association, but the commission "is in this business to stay and so can address regulatory reform incrementally."

The U.S. Department of Justice, the House Telecommunications Subcommittee and the General Accounting Office (GAO) all have criticized the FCC recently. One specific complaint made by the Justice Department against last December's "Computer II" decision is that it does not prevent the regulated part of the Bell System from subsidizing unregulated product research and development through the license contract fees that AT&T operating companies now pay Bell Laboratories. Justice believes this loophole should be closed before the FCC decision takes effect early in 1983.

Jones explained that the commission is now examining Bell's license contract arrangements and in the process will obtain a "better basis" for specifying any further separation "which might be required."

Referring to the GAO's criticism [CW, Sept. 28], Jones said "a true resolution of these issues might involve the commission deeply within the business decisions of the subject carrier. If involvement becomes deep enough, it may be tantamount to nationalization." Less drastic changes might be achievable, "but they are yet to be developed."

She also said:

- A group is now being created within the FCC's enforcement division to monitor transactions between the regulated and unregulated parts of the Bell System.

- The commission is likely to receive "many more" petitions for re-

consideration of the Computer II decision.

- "The regulatory cost of maintaining a separate AT&T subsidiary... will be higher than many of us care to believe."

- It's "extremely unlikely" that Congress or the FCC will require AT&T to divest the offering of enhanced services and terminals. Thus, AT&T will probably have a separate subsidiary.

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From Hardware to Software

Keynoter Cites Managers' Shifting Concerns

By Brad Schultz

CW New York Bureau

SAN FRANCISCO — The prime concern of systems managers is shifting from hardware and processing to applications and end-user impacts, AT&T's Archie J. McGill told the annual Data Processing Management Association (DPMA) Conference here last week.

The vice-president for business marketing said AT&T will offer "total" information systems solutions, pitching its products and services in terms end users can appreciate. Most managers consider what information systems do to the organization more important than how they do it, he indicated in the conference's keynote address.

Managers want systems to propel useful information swiftly and reliably through the organization, making data communications a key aspect of systems functions, McGill observed. As the world's largest common carrier and supplier of telecommunications equipment, AT&T is well-positioned to market systems with leading-edge data communications capabilities, he suggested.

Some Incentives

Vendors now have great incentive to develop and sell total information systems, McGill pointed out, because of three factors — deregulation of telecommunications and the computer industry, integration of information technologies and user demand for comprehensive solutions.

McGill described four levels of information technology and claimed that vendors will shoulder responsibility for the two lowest levels, freeing "the information systems planner to focus on solutions to business problems and user interfaces."

Level one, "the foundation of the information system," includes "chips, integrated circuits — the underlying technical structure of the system," he explained. Level two was termed "system or product technology — the terminals, CPUs, the networks that link them, the modems."

Major vendors like AT&T will advance levels one and two without much fanfare outside the community of technical experts. The limelight,

McGill indicated, will shift to level three — "programming systems: the software packages that enable the information systems to do their jobs" — and level four "the interface with the end users."

Systems professionals impact corporate objectives in proportion to the time they spend on levels three and four, McGill declared. "And that impact moves the data processing manager from the role of a specialist to the role of an integrated partner on the management team."

Early information systems were designed to eliminate paper flow within departments of an organization, he told DPMA. After this vertical

automation came horizontal automation, where systems were intended to eliminate paper flow between de-

partments.

In the future, systems will render "intercompany" automation, eliminating paper flow "between one company and another, or between one company and its customers, suppliers or even government agencies."

Bell is preparing for a grand assault on the problems of intercompany automation, McGill hinted.

According to McGill, companies have automated a small fraction of their communications with each other, but are willing to automate most communications as voice store-and-forward, electronic mail and similar services hit the market.

Besides automating flow of information, Bell systems will control energy usage and environmental conditions within customer premises, McGill predicted. The telecommunications behemoth is also testing cellular mobile radio stations in Chicago, he added.

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Corrections

In "Amdahl Returns IBM 3081 Volley" [CW, Nov. 2], it was reported that the Amdahl Corp.'s 580/5870 computer consists of a Model 5860 processor supplemented by an extra processing board. The 5870 includes "an entirely separate CPU rather than an extra processing board," an Amdahl spokesman explained. And, like the 5870, the Model 5860 processor can be configured with up to 34 I/O channels with 32M bytes of main memory, Amdahl said.

In the Nov. 2 softline column, "Data Management for the End User," the interpretation of values should have been that the values \$100, 3.99, 10 and 4 dollars will automatically be converted to 100.00, 3.99, 10.00 and 4.00.

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Measure of Firm's Worth Seen in Data, Not Bank

By Tim Scannell
CW Staff

SAN FRANCISCO — How do you judge a company's value? It may be by the sophistication of its information network rather than by how much money it has in the bank, a consultant said here last week.

The information industry has always been in a state of change, only now that change is driven by the proliferation of computer-based networks and not just by hardware or software, according to Gerard Hallaren, a consultant with The Yankee Group.

In fact, a company's ability to construct and expand these networks — and to put them to better use as a flexible corporate resource — may ultimately decide whether that company lives or dies in the marketplace.

Speaking at the Data Processing Management Association's (DPMA) international conference, Hallaren outlined how integrated knowledge networks would alter the way companies and managers do business.

Information networks have been increasing at a phenomenal rate. For instance, while there are about 1,500 firms across the country that currently have IBM Systems Network Architecture capabilities, that number is expected to leap from 3,300 to 3,500 companies by 1983, according to Yankee Group figures.

Consequently, there has been a quantum increase in the number of

distributed data processing (DDP) and decentralized processing (DCP) systems. Today the total market for DDP/DCP systems approaches \$38

CW At DPMA

billion and is expected to go from \$45 billion to \$50 billion by 1985, Hallaren stated.

At the moment there are four different levels of networks, each dominated by one or a small group of vendors. The first is led by IBM, which is promoting the central site, host system type of arrangement with a variety of nodes spread out in all directions. IBM's strategy is to offer host management and maintenance of a network, transportable and easily customized software, simplified applications development and user interfaces and a variety of add-on hardware and software facilities.

The second level consists of a network based on a collection of transmission subsystems. This level is dominated by AT&T and populated by a number of "flies" like Tymnet, Inc. and GTE Telenet, Inc.

AT&T's strategy is one of survival, Hallaren added. The firm realizes that users are trimming their transmission costs by installing new hardware, so it plans to make up for these losses by selling that hardware. The bottom line of this competition with IBM and other first-level vendors is that the user will have to make up his mind early which monopoly to pay — IBM or AT&T, Hallaren said.

The third and most active level includes the satellite processor manufacturers. They market systems that process portions of data at various locations that is all brought together or viewed separately to get a final picture. Satellite sites will be one of the primary battle grounds for the 1980s, Hallaren predicted.

Finally, perhaps the most influential and rapidly developing market involves workstations and personal computer systems. These not only can be used as private resources, but can be linked to other machines in the network. Because these systems offer "a window to the rest of the network" — especially to a nontechnical person — it is probably the most carefully developed and designed of the four levels, Hallaren said.

Where do all these network types and evolving technologies leave the systems manager? Unfortunately, right in the quick of things.

Instead of being limited to directing the operations of a single-site computer room, managers are now expected to keep tabs on a widely scattered network of systems, Hallaren pointed out.

As a result, more and more managers are taking part in the establishment of these distributed or decentralized computer networks. Subsequently, the managers' job has become more complex and actually begins before a network is even implemented, Hallaren explained.

Rules Listed For DDP

SAN FRANCISCO — Just as there are rules for operating a car, there are rules that should be followed when implementing a distributed or decentralized processing system, The Yankee Group's Gerald Hallaren told the Data Processing Management Association here last week. Hallaren's rules:

- Have a well-defined network and establish early where controls will lie.
- Use new or noncritical applications when installing the network so that the whole business flow will not be upset if something goes bump.
- Perform host communications with the nodes in a batch mode and during less expensive off-hours.
- Gradually phase in network processing, then take up most of the remote systems time with local processing tasks.
- Develop office automation capabilities along with the network. For example, if you are stringing coaxial cable for a baseband-type local network, run fiber optic cables alongside. That way, if and when the company decides to use fiber optics transmissions, the cost of installation will not be prohibitive since the cables are already in place.
- Examine the system's architectural costs now and five to 10 years in the future. If some costs seem to be dropping over time, plan an appropriate migration path to take advantage of the cost savings.

Speaker Advocates Installing DBMS in Pairs

By Jeffrey Beeler

CW West Coast Bureau

SAN FRANCISCO — One data base management system (DBMS) is often inadequate to meet the diverse needs of all a user organization's members. As a result, many companies are increasingly installing DBMS in pairs, according to Lt. Col. Robert Tufts of the U.S. Air Force's Data Services Center in Washington, D.C.

In a typical dual-DBMS setting, one system is aimed primarily at a company's line personnel and serves as a repository for live production data that requires constant updating. The other system is usually tailored to managers and thus can probably be characterized as a condensed version of its production-oriented counterpart.

"A [management-styled] DBMS gives its users access to only a subset of their company's overall data base and allows them to answer many business related questions by cutting across their production data in a variety of ways," Tufts said. Tufts' comments came during an address at the

1981 Data Processing Management Association's International Conference and Exposition, where he discussed ways to "Avoid the Snakepits of Data Base Implementation."

The advent of specialized data bases for managers signals a continuing user shift from single- to dual-DBMS environments, he added.

Implement in Small Steps

Tufts, who serves as deputy director of the Air Force's air staff systems and is reputed to be among the U.S.' top 25 DBMS experts, urged his listeners to implement their data bases in small, easy-to-manage steps.

If a DBMS development project starts modestly and quickly runs aground, a user can easily minimize

its losses.

"But if you start with a million dollar system and the project bombs, I

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guarantee you'll be out on the street so fast it will make your head spin," Tufts said.

Roughly half of all first-time DBMS development efforts end in total failure, he warned.

In general, no single phase of a data base implementation project should take longer than six months to complete. Any effort that exceeds that

time limit is probably overly ambitious and deserves to be simplified.

In related remarks, Tufts advised prospective developers of management information systems not to allow supervisors to develop their own ad hoc queries. "Most managers don't have enough time to learn query languages or data base structures, and if they do have the time, they're probably not devoting enough of their energy to managing," Tufts said.

"Query routines should always be written by a computing specialist. Once the queries are developed, managers can assume the responsibility for deciding how and when the routines should be applied," he said.

Bell Supervisor Urges Data Plan

By Brad Schultz

CW New York Bureau

SAN FRANCISCO — "The business of business is data," said a session speaker here at last week's Data Processing Management Association (DPMA) conference.

Roger L. Wood is supervisor of data systems support at AT&T's operation in Piscataway, N.J. In a company as big as AT&T, thousands of managers contend for access to many kinds of data, he noted. Large companies need a corporate data plan to spell out who gets what data, the meanings of different data sets and how different data sets correspond to many separate business functions.

When systems professionals complain about top management indifference to their problems, the real source of woe is lack of an adequate corporate data plan, Wood told the DPMA session. However, only top managers can provide the global perspective necessary to construct a worthwhile data plan, and he indicated the process by which a plan should be developed is complex and delicate.

Launching the Process

To launch the process, top managers should delegate responsibility for studying the data needs of various departments to people who are sensitive to the priorities and objectives of end users.

A corporate data plan implies that data is a corporate resource, like money or people, Wood pointed out.

Some organizations have called data a corporate resource since the late 1960s, Wood declared, but users are just beginning to perfect methods for tracking the value of data, let alone what the value of data means in deciding whether to decentralize processing, change access privileges, restructure systems staffs or change the way end-user departments report to each other.

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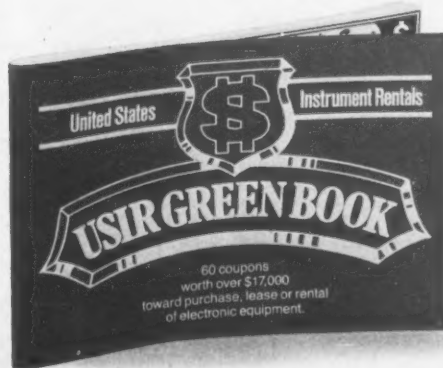
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Commercial Firms Discover Supercomputers

(Continued from Page 1)

But more commercial firms are discovering that supercomputers can run in several hours the massive programs that often took weeks on conventional large mainframes.

The petroleum industry is one of the first to turn to supercomputers, chiefly for oil exploration. Meteorological agencies use the processors' sophisticated modeling capabilities to track storms. The auto industry is reportedly looking at supercomputers for use in large-scale design facilities. Even large service bureaus are buying supercomputers and offering the processors' extensive modeling capabilities as part of their computer services.

But supercomputers still are not for everyone.

For one thing, not all types of applications are suited for vector processing. The main difference between a vector processor and a conventional scalar processor is this: a scalar processor makes one calculation at a time, while a vector processor performs many calculations simultaneously. That is, many jobs can be processed concurrently in a nonsequential manner. This means that a string of ADD commands, for example, can be executed in one fell swoop.

Vector processing can be useful in programs that employ a great deal of calculations or that use extensive looping techniques. Vector processors tend not to execute file-oriented programs, such as accounts receivable packages, with equal efficiency.

Price is another limiting factor. Supercomputers are not cheap. They cost between \$7 million and \$17 million each. But supercomputer vendors are quick to point out that one supercomputer for \$10 million can be more efficient than five conventional processors, like IBM's 3033s, which cost about \$2 million each.

The defense industry was a prime force behind the development of the supercomputer. About 10 years ago, the U.S. government, among others, decided large-scale weapons and other nuclear devices could only be built and tested with the aid of a processor with extensive modeling capabilities. Since the models were long and complex, the time necessary to run the programs became a problem for mainframe processors such as

Product Spotlight

System	Cray-1/S	Cyber 205
Characteristics		
MFlops ¹	2-140 ¹	50-800 ²
Main Memory (in bytes)	2M-32M	8M-32M
Purchase Price	\$5.3 Million-	\$5.9 Million-
(memory size)	\$13.7 Million	\$14.5 Million ³
Lease Price		
(lease term)	\$127,000-\$328,000	\$131,000-\$322,000
Machine Cycle		
Time (Nsec)	12.5	20
Channels	1-12	8-16
Cache Buffer		
Size (Bytes)	8M-64M	None
Bus Architecture	No	No
Price per 1M		
Bytes of Main Memory	\$200,000	\$287,500
Front End Interfaces	1-3	1-7

Notes:
 1. Millions of floating point operations per second based on vendor claims.
 2. Prices range from a 2M-byte processor to a 32M-byte four-I/O processor.
 3. The price for CDC systems range from an 8M-byte single pipeline system to a 32M-byte four pipeline processor.

pipeline processing techniques. The Cray-1 uses essentially third-generation technology with little virtual memory and does not use a pipeline philosophy. Cray said a large virtual memory and pipelining only slows down the processor.

Another major difference between the two processors is software. Cray believes software development is the user's chore, assuming the applications are so specialized that it is difficult to offer efficient standardized programs. CDC, on the other hand, offers more standardized software for the Cyber 205 and said it will be announcing more.

CDC said it plans to market its processor to commercial users, a less sophisticated group than big government agencies, which often prefer to develop their own OS and all applications software for top secret uses.

The Cray-1 has been on the market since 1976, and there are now 33 systems installed. The Cyber 205 is installed in only two locations, however, CDC has seven more orders for its processors.

Since the largest of CDC's 250 processors have yet to be installed, the firm's claims of up to 800M-floating-point operation/sec have only been achieved in the laboratory. However, even Cray admits the Cyber 205 has the potential to outperform the Cray-1. Cray contends that the Cyber 205 will only better the Cray-1 in specific applications, while CDC said it is an all around better processor.

Cray and CDC are hot competitors in one sense and companions in another. Cray uses CDC peripherals and can use CDC's Cyber 170 as a front-end processor. But as one observer noted, the two firms' sales contact lists are virtually identical. In spite of the competition, both Cray and CDC said they have more orders than they can fill for the immediate future.

The Other Vendors

While Cray Research, Inc. and Control Data Corp. are the best known names in the supercomputer business, other vendors compete in the same marketplace. Most of their processors use a pipeline technique. They include:

- Denelcor, Inc., which markets the Heterogeneous Element Processor.
- ICL, Inc., which offers the Distributed Array Processor.
- Floating Point Systems, Inc., which sells the AP190B array processor.

Auerbach Publishers, Inc. said that none of these processors have

been shipped in significant enough quantities to be considered serious competitors to Cray and CDC.

In 1977, Burroughs Corp. announced a large vector processor called the Burroughs Scientific Processor (BSP). The firm had one solid order for the processor, but software problems forced it to reconsider the idea of competing in the supercomputer business, a spokesman said. Burroughs then decided the supercomputer business was not large enough to revamp the system and decided to cancel it after about a year.

IBM's 370 and Control Data Corp.'s Cyber series.

One solution to the problem was to link mainframe processors together to form a larger pipeline processor. In this arrangement, each pipe would execute one part of a program. Supercomputers are basically an extension of that concept; the only difference is that CPUs are more compact.

CDC, Cray Dominate Field

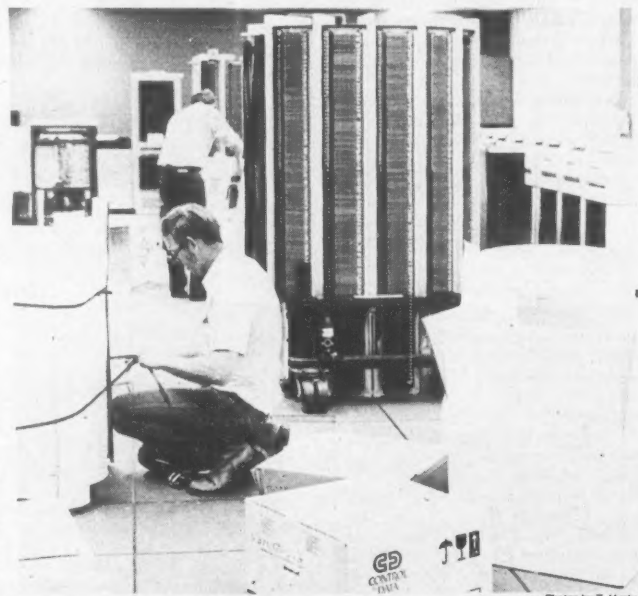
Two major vendors dominate the supercomputer business: CDC and Cray Research, Inc. Other vendors make processors aimed at the same market, but only Cray and CDC sell processors with true scalar and vector processing capabilities.

Cray's offering is the Cray-1/S; CDC makes the Cyber 205. In many ways the two processors are very similar. They share a common parentage, CDC's Star-100 processor, and the design philosophies that came out of CDC in the late '60s and early '70s.

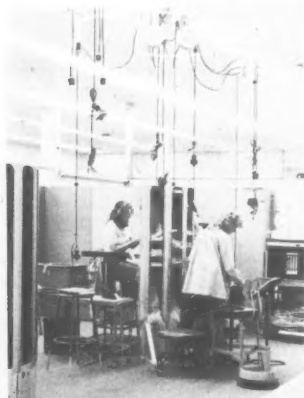
Seymore Cray, one of the founders of Cray Research, worked at CDC on the Star-100. He left CDC in 1974 and announced the Cray-1 two years later. At the same time, CDC was working on the Cyber 203, a big scalar processor based on large-scale integration technology, which was later incorporated into the Cyber 205.

The Cyber 205 employs newer tech-

nology than the Cray-1, offers basically unlimited VS and incorporates



Two Cray-1/S processors are packed for delivery. Proper packing is important; some long-time Cray employees recall preparing one processor for delivery to a user so secret that the multimillion-dollar processor was left in a parking lot for later pickup. Cray usually uses peripherals from Control Data Corp., hence the CDC box in the foreground.



Workers assemble a Cray-1/S processor at the firm's Chippewa Falls, Wis., manufacturing facility.

The Cray-1/S

By Tom Henkel

CW Staff

Cray Research, Inc. has been selling the same basic processor since its introduction in 1976. What started out as the Cray-1 later became the Cray-1/S when, in 1979, Cray made some major changes to its processors.

The firm switched from 1K-bit memory chips to 4K-bit chips and adopted an IBM-style I/O channel. It also adopted Control Data Corp. double-density disk drives to enhance storage capacity. However, the most significant change was the introduction of an I/O subsystem, which boosted I/O throughput and off-loaded I/O channel control functions from the CPU.

The I/O subsystem can be configured with one high-speed memory channel and two CRT terminal consoles and a peripheral expander can be added to handle a card reader, a

printer/plotter or a tape unit.

The Cray-1/S line consists of 12 models in four categories:

- Models S/250, S/500 and S/1000 offer 2M-, 4M- or 8M bytes of main memory, respectively, and cannot use the I/O subsystem. Instead, each of the processors employs a mass storage subsystem using from two to eight CDC (or compatible) DCU-3 disk control units and from two to 32 DD-29 disk storage units.

Systems can be configured with a maintenance control unit, which includes a Data General Corp. Eclipse diagnostics processor, a card reader, a magnetic tape unit, a removable pack disk drive, one printer/plotter and two CRT terminal consoles.

- The rest of the S/1000 series, namely the S/1200, S/1300 and S/1400, can use two-, three- or four I/O processors, respectively. Each of the

(Continued on Page 20)

Cray-1 Installed Base

User ¹	Installation Date	Application
AERE ² UK	3/81	Government Classified
National Center for Atmospheric Research Boulder, Colo.	11/77	Meteorological Research
Los Alamos Laboratories Los Alamos, N.M.	6/77	Government Classified
Magnetic Fusion Laboratories Livermore, Calif.	5/78	Government Classified
Shell Oil ³	5/81	Petroleum Research
European Center for Medium-Range Weather Forecasting UK	11/77	Meteorological Research
Lawrence Livermore Laboratories, Livermore, Calif.	1/79	Classified
UK Government	11/78	Classified
University of Minnesota ⁴	10/81	Scientific Research
Max Planck Institute West Germany	11/79	Scientific Research
Lawrence Livermore Laboratories	9/81	Classified
Bell Telephone Laboratories	1/80	Circuit Design
Los Alamos Laboratories	12/79	Classified
Century Research Corp. Japan	1/80	Computer Services
Los Alamos Laboratories	3/81	Classified
Mitsubishi Research Japan	7/80	Computer Services
Boeing Computer Services	7/80	Computer Services
Sandia National Laboratories Livermore, Calif.	9/80	Classified
Lawrence Livermore Laboratories	10/80	Classified
United Computing Services	10/80	Computer Services
Cray Research	9/81	Software Development
Getia	3/81	Computer Services
Arco	3/81	Petroleum Research
UK Government	3/81	Classified
Westinghouse Corp., Pittsburgh, Pa.	7/81	Power Plant Design
U.S. Air Force Weapons Laboratory	9/81	Classified
Magnetic Fusion Laboratory	9/81	Classified
National Aeronautics and Space Administration Ames Laboratories	TBA*	Aerodynamic Research
Los Alamos Laboratories	TBA	Classified
Exxon Corp.	1/82	Petroleum Research

Notes

1. There are four additional processors that are installed at classified U.S. government sites.
2. The UK government is the latest user of this processor. It has been installed at five other installations since the mid-70s.

3. This processor was formerly installed at United Computing Services, Inc.
4. This was Cray's original software development processor. Cray installed a larger processor for software development.

* To be announced.

The Cyber 205

By Tom Henkel

CW Staff

Control Data Corp. introduced one of the first processors that could perform both scalar and vector functions in 1974 when it announced the Star-100. That processor was followed by the Cyber 203, announced in 1979 as a concurrent scalar processor. A year later CDC added a vector processor to the Cyber 203 to form the Cyber 205.

The Cyber 205 employs an almost unlimited virtual memory capacity (about 16 trillion bytes) and can operate with up to four parallel segmented pipelines that reportedly make the vector processing more efficient.

There are six basic models, which vary according to memory size and the number of pipelines in the system.

The Models 205-11 and 205-12 offer 8M bytes of main memory and one or two pipelines, respectively. The 205-422 and 205-424 offer 16M bytes of

main memory and two or four vector pipelines. The 205-442 and 205-444 offer 32M bytes of main storage and two or four vector pipelines.

The Cyber 205 contains separate scalar and vector processors. The scalar portion is essentially a Cyber 203 that uses a 64-word instruction stack, which permits many large loops of code, once loaded into the stack, to be executed without repeated memory references to reload the stack.

The vector processor can operate in parallel with the scalar unit. Each operand in a vector operation can contain data in sets of up to 65,535 elements. CDC said that in a vector-processing mode the Cyber 205 can operate at up to 800 million floating point operation/sec and up to 50 million instruction/sec in a scalar mode.

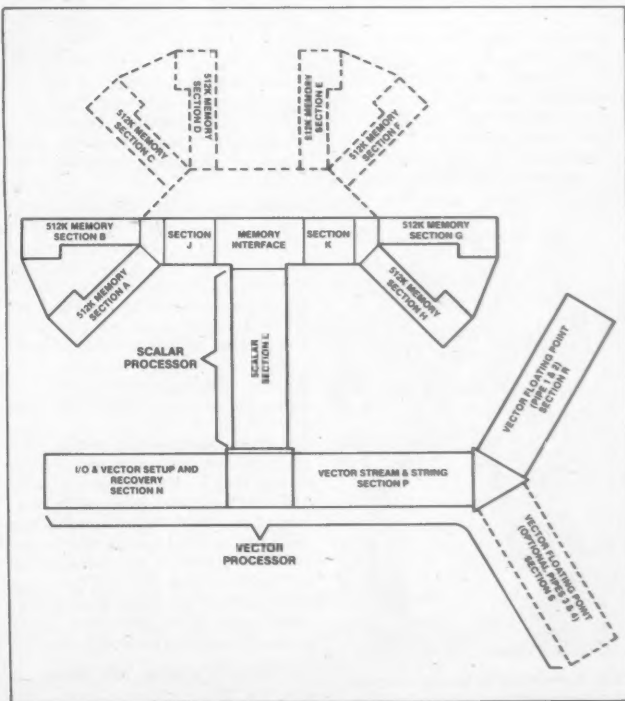
The processor can address up to 4 million 64-bit words and can accommodate up to 16 I/O ports with a total I/O rate of 3.2G bit/sec.

(Continued on Page 21)

Cyber 205 Installed Base

User	Installation Date	Application
UK Ministry of Defense, Meteorological Office	9/81	Meteorological Research
University of Bochum Bochum, West Germany	4th quarter 1981	University Computer Services/Research
Colorado State University Fort Collins, Colo.	TBA*	University Computer Services/Research
U.S. Dept. of Commerce Geophysical Fluids Dynamic Labs - Princeton, N.J.	TBA	Meteorological Research
National Aeronautics and Space Administration Goddard Space Center, Beltsville, Md.	TBA	Aerospace Research
Unannounced Classified	TBA —	Petroleum Research Classified

* To be announced



Cyber 205

Since Late 1940s

Supercomputers: Only a Few Success Stories

By Jack Rochester
CW Staff

Most definitions of the supercomputer are highly technical and quantified, concerned with memory access, millions of floating-point operations per second (Mflops) or price. However, the best working definition comes from Neil Lincoln, an executive consultant with Control Data Corp.: "A supercomputer is a computer that is only one generation behind the problems the customer is presently experiencing."

The notion of increasing computing performance while being able to accomplish multiple functions at the same time was first considered in the late 1940s. Scientists tried harnessing a number of scalar processors together and came up with an early prototype of the multiprocessor. Expanding on this work, Daniel L. Slotnick at Westinghouse developed the Solomon I multiprocessor in 1963.

None of these machines were actually used for processing applications, but such work led to the Illiac IV, an array or parallel processor developed jointly by Burroughs Corp. and the University of Illinois. Slotnick was principal architect, working with Dave Kuck and Duncan Lawrie. One was delivered to the National Aeronautics and Space Administration's (Nasa) Ames Research Center, Moffett Field, California in 1972.

Burroughs also developed the Parallel Elements of Processing Ensemble (Pepe), which never reached the market. A parallel processor essentially can run at both high and low speeds — multiprocessing — but tends to be defined and thus limited by the lower operating speed. Denelcor, Inc., of Denver and International Computers Ltd. in England continue to work with parallel processors, but none have attained significant acceptance.

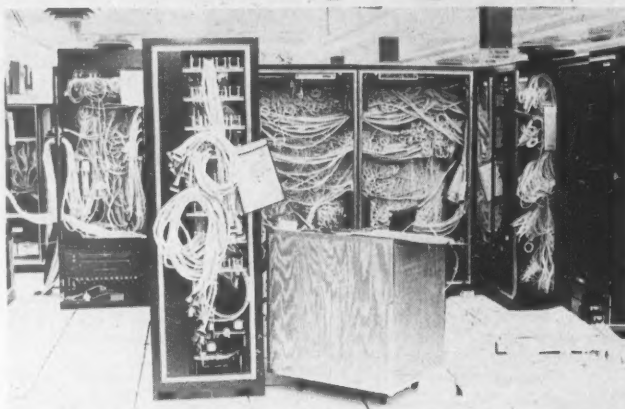
In the mid-50s, IBM had a team working on something called the Stretch Project, developing several supercomputers for Los Alamos. They hoped Stretch would become commercially profitable for other users as well. Of the \$50 million spent, IBM reportedly lost \$20 million and killed the project.

About 10 years later, after the an-



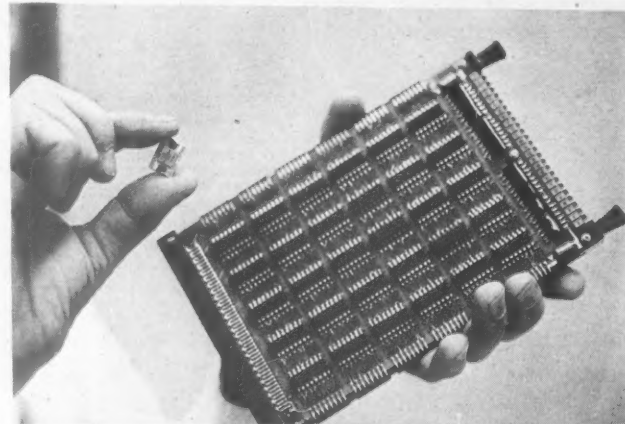
CW Photo by T. Herkhal
Cray Research's program manager, Bill Cunningham, stands inside a cylindrical Cray-1/S processor.

Product Spotlight



CW Photo by T. Herkhal

With its decorative panels removed, a Cyber 205 undergoes final testing at Control Data Corp.'s Minneapolis manufacturing facility. Like the Cray-1, the Cyber 205's miles of wires come in only one color. While the thought of connecting the wires properly may seem impossible, specific wiring diagrams make assembly quite easy.



About 30 different types of pluggable LSI circuits are used inside Control Data Corp.'s Cyber 205 central processor. The high-density chips are packed at 168 gates per chip and feature sub-nanosecond switching times. This circuit board contains the equivalent logic of the entire CDC Star-100 processor, the firm's first supercomputer, introduced in the early 1970s.

announcement of the 360 series, IBM announced a supercomputer called the Model 90, which was to compete head-on with CDC's best machine. Three years after the announcement, no machines had been delivered or, for that matter, even built. In 1967, this project was killed too, and the 17 standing orders IBM had were filled. To date, IBM has not announced any new plans to enter the supercomputer market.

In 1960, the first two commercial all-transistor computers were introduced: IBM's 7090 and CDC's 1604. The CDC machine, designed by Seymour Cray, was CDC's first computer and was intended specifically for the scientific market. It was followed by the 6600 in 1963, the first computer to use germanium rather than silicon transistors, which facilitated vector processing and pipelining.

First-Generation Machines

The advent of vector machines ushered in the era of the supercomputer.

Such a machine was not possible until Seymour Cray, considered by many the father of the supercomputer, was able to use germanium transistors in circuit design, which allowed for higher component density and greatly reduced distances between circuit boards.

A vector processor allows two data sets, or vector registers, containing up to 64 operands, to be calculated with one instruction. A scalar processor calculates one operand at a time, then stores the results. Vector machines pushed performance into the Mflops.

The CDC 6600 was followed by the 7600 in 1969, a machine that was renamed the Cyber 76 and then the 176 in 1975. It was well-received and helped CDC dominate the market throughout the '60s and into the early '70s. Fifty-nine 6600s were installed and 27 7600s.

In 1973, Seymour Cray left CDC to form Cray Research, Inc. Shortly thereafter, CDC introduced the Star-

100, a string array processor which, while fast, was not successful on the market. Seymour Cray was supposedly not involved in the Star's design, which some claim accounts for its lack of success. CDC asserts that the machine was merely a prototype for its Cyber 200 series and was never intended for commercial sales. Only four were installed.

Texas Instruments, Inc. dipped into and out of the market in the '70s with its ASC, or Advanced Scientific Computer. Like the Star-100, it was a string array machine, but unlike it, was stand-alone. While it could have been successful because it did not require a front end, it was never aggressively marketed and ended up being used primarily within TI; four out of seven installations were for corporate use.

The Second Generation

The Cray-1 was introduced in 1975 and has become the most successful supercomputer in use; Cray Research has either leased or sold 36 machines and expects to deliver another 16 in 1982. CDC hopes to match or top the Cray-1 with its Cyber 205, introduced last year; benchmarks vary, therefore reported cycle times vary as well.

In any event, both Cray and CDC are acknowledged to lead the vanguard in supercomputers. There are several variations on the Cray-1 available (see accompanying story, Page 17) which make it appropriate for other than purely scientific uses. CDC has broadened its customer base with the Cyber 205, announced in 1981, an all-large-scale integration machine that competes head-on with the Cray. One was installed in 1981, with seven more installations planned for 1982. There was one prior 200 Series machine, the Cyber 203, in 1978.

Burroughs announced the Burroughs Scientific Processor (BSP) in 1979. Its major drawback was that it required a Burroughs front end, making compatibility a problem in scientific labs and only one was delivered. Earlier this year, Burroughs canceled production on the BSP.

The Next Generation

Supercomputers will continue to be used for scientific number-crunching, but will find a broadened customer appeal in corporations requiring complex simulations. Oil, natural gas, water, seismic and weather explorations can profit by computer simulations; so can automobile, aircraft and nuclear reactor designers. Nasa has requested bids on a wind tunnel simulator supercomputer with a sustained performance of 1 Gflop. Burroughs and CDC have bid on the project and it is reported that Seymour Cray is at work in his Chippewa Falls, Wis., laboratory on a machine 10 times faster than the Cray-1. It is interesting that even though the human brain is not as well-understood as the computer, that same brain has conceived and designed a machine that works 100,000 times faster than itself. And we have only just begun.

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I/O System Key to Cray-1/S, Boosts Throughput

(Continued from Page 17)

processors comes with 8M bytes of main memory and can use 4M- or 8M bytes of buffer storage.

The S/1200 can operate with one to four DCU-4 disk control units and two to 16 DD-29 disk drives. The S/1300 can access one to eight DCU-4s and two to 32 DD-29s while the larger S/14 can operate with up to 12 DCU-4s and up to 48 DD-29s.

In addition to those features, the S/1300 and the S/1400 can use from one to four block multiplexer controllers and are available with one to 16 block multiplexer channels.

The S/2000 series consists of the S/2200, S/2300 and S/2400. Each offers up to 16M bytes of main memory and can accept two, three or four I/O processors, respectively. Like the S/1000 series, the processors can access between 4M- and 8M bytes of buffer storage, and the same disk storage and block multiplexing configurations are available.

The top-of-the-line S/4000 series offers a maximum of 32M bytes of main memory and the same basic I/O processor, disk storage, buffer memory and block multiplexing configurations as the S/1000 series and the S/2000 models.

Optional Features

All of Cray's systems come with power and cooling equipment and can be configured with one standard and two optional front-end interfaces. Currently supported front-end processors include CDC's Cyber 70/170 as well as the firm's 6000 and 7000 processors; IBM 370-era (and PCM systems) as well as most Honeywell, Inc., Digital Equipment Corp., Data General Corp. and Systems Engineering Laboratories processors. The firm noted that interfaces can be developed for other processors as well.

The Cray-1 central processor employs a unique design that appears more suited to a hotel lobby than a computer room.

The 6.5-ft high hollow semicylindrical unit grew out of Seymour Cray's battle with the speed of light. The arc-like design allows the use of relatively short wires, the longest being about three ft.

The CPU consists of 13 fully segmented functional units that operate in parallel to support both vector and scalar processing of fixed- and floating-point arithmetic as well as Boolean operations.

The Cray-1/S uses COS — a multiprogramming batch op-

erating system similar to CDC's NOS/BE and Scope 2. COS monitors system re-

sources by allocating memory and mass storage, scheduling jobs and maintaining accounting records. The operating system can handle up to 63 jobs concurrently using

an exchange mechanism — a technique of switching execution from one program to

erations.

The Cray-1 programming language is a specialized version of Ansi '66 Fortran. Routines are provided to determine when an operation can be vectorized.

While Cray offers some software such as Update, a source language modification system; Blas, a series of basic linear algebra subprograms; and CFFT, fast fourier transform software, the firm

has taken the stance that applications software should be developed by the user.

Cray contends its users are quite experienced in developing software, and there are few applications that can be standardized to its users' needs. Hence, specialized software is unnecessary. This is one of the fundamental differences between the Cray and CDC marketing approaches.

Product Spotlight

sources by allocating memory and mass storage, scheduling jobs and maintaining accounting records. The operating system can handle up to 63 jobs concurrently using

another.

Cray Assembler Language (CAL) is similar to CDC's Compass language for the Cyber 170 series. It can handle both vector and scalar op-



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ture and sound quality than with film-loop systems.

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With the Panasonic NV-AB50 Programmable Auto-Search Controller, virtually any segment on a cassette can be retrieved at the touch of a button. Its memory can store up to 64 separate tape locations on a single cassette. You can



Cyber 205 Boasts Memory of 16 Trillion Bytes

(Continued from Page 17)

Circuitry is large-scale integration (LSI) bipolar gate array emitter-coupled logic (ECL) and the CPU uses 29 different LSI chips.

The processor has a 48-bit virtual address space and actual virtual address space is limited by the number of CDC 819 disk drives connected to the system. The unit has selectable page sizes ranging from 512 words to a

maximum of 65,536 words. And either 32-bit or 64-bit floating-point arithmetic can be supported.

The Cyber 205 is available with eight to 16 I/O ports. Each port is capable of transferring data at 200 bit/sec with a high memory width of 512 bit/20 nsec for an 8M-byte system to 1,024 bits for a 32M-byte system.

Central memory is a single-level random-access memory

that uses bipolar integrated circuits.

A maintenance control unit

code memory.

The Cyber 205 has a specialized operating system, Cyber

Product Spotlight

is included with the processor, which provides monitoring, lodging and recovery of CPU faults, as well as control of the CPU diagnostic system and management of micro-

200-OS, which is basically an outgrowth of the Star-100 operating system.

The operating system is designed to accommodate Fortran and a Meta assembler

language. Cyber 200-OS permits concurrent and parallel operations of many computational and concurrent I/O activities. The operating system supports virtual memory addressing and I/O can be performed implicitly or explicitly.

Cyber 200-OS considers every program to be executable only in virtual memory, meaning every page in virtual memory has a corresponding space on a disk.

Three Parts

The OS is basically divided into three parts: user tasks, privileged tasks and virtual system tasks. A resident system runs in a monitor mode. It resides in main memory and references memory by absolute addresses rather than through the virtual-paging mechanism.

Virtual system tasks run in the user mode and can be called as needed to reference memory by virtual addresses. Privileged tasks have the same characteristics as virtual system tasks but may not modify system tables directly.

The Cyber 205 can be accessed by a front-end mainframe; CDC uses the Cyber 170 under the NOS operating system as an example.

'Folio' Covers Documentation

CHICAGO — Ways to meet the demand for better documentation are explored in the fall 1981 issue of Sandra Pakin & Associates' journal, *Folio*, the consulting firm here announced.

Among the methods described are training analysts and programmers for documentation development, having users do their own documentation, creating a technical writing position or unit and hiring qualified personnel.

Subscriptions to *Folio* cost \$40/year from Sandra Pakin & Associates, 6007 North Sheridan Road, Chicago, Ill. 60660.

Book Explains Screen Design

WELLESLEY, Mass. — Q.E.D. Information Sciences, Inc. has published a list of rules for CRT screen design formats.

Called *The Handbook of Screen Format Design* and written by W.O. Galitz, the book is based on physiological principles and an analysis of experimental results, the firm said.

The 212-page book costs \$28.50. Q.E.D. can be reached through P.O. Box 181, Linden St., Wellesley, Mass. 02181.



even pre-program it to automatically play back up to 15 segments in any order. The NV-A850 features LED readouts in hours, minutes, and seconds, as well as fast forward, rewind, pause, stop, and frame advance.

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The NV-8200 and NV-8170 are designed to stand up to rigorous use with critical components mounted on a rugged annealed aluminum die-cast chassis. And for low jitter and excellent picture stability, both decks feature a direct-drive video head cylinder and capstan servo. Both decks also have tough crystal-oriented HPF™ video heads. The results: A signal-to-noise ratio of 45 dB, horizontal resolution of 300 lines black and white and 240 lines color,

and high-quality pictures even under continual use.

Both decks are solenoid operated. And, with the NV-A810 Remote Controller (optional), all machine functions can be operated from the palm of your hand.

Worldwide applications.

For multi-national companies, the NV-8170E (not shown) is a natural because it can play tapes recorded in either PAL or NTSC formats. How does it do it? With its PAL or modified NTSC video output, DC motors and multi-voltage capability.

Perhaps the best part of

these Omnivision II decks is what they are part of: A total video communications system. Including portable and studio cameras, monitors, recorders and a wide choice of accessories. It takes a lot to deliver versatility. And any way you look at it, Panasonic has what it takes.

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Despite Claims to Contrary Programmer Productivity Seen in Decline

By Tim Scannell
CW Staff

SAN FRANCISCO — Despite claims to the contrary, programmer productivity has been at a virtual standstill for the last 20 years. In fact, taking into account all of the programming tools, state-of-the-art systems and support now available, productivity has actually de-

clined during the last two decades, according to Gopal K. Kapur, president of Kapur

firm. The results of the study were presented here last week at the Data Processing

centrated on first- and second-line managers from 11 organizations: four medium-size firms, containing 40 programmer/analysts or less; four large-size firm, with 75 programmers or less; and three very large firm, with up to 270 programmers on staff. Kapur's firm not only examined each company's software technology, but fo-

cused on each manager's ability to interact with the DP staff, executives and computer users. The managers' acquired technical and management techniques — their self-management skills — were also taken into consideration, he said.

CW at DPMA

& Associates.

Kapur drew these conclusions from a study recently completed by his consulting

Management Association's (DPMA) International Conference and Exposition.

The 18-month study con-

Bad Programs

After examining the results of the study, Kapur found that programmers were not only writing bad programs, but they were writing them faster than ever. The main reason for this, he discovered, was that managers and programmers were not using state-of-the-art software engineering techniques.

For example, many of the managers surveyed complained that it was difficult to keep track of each programmer's specifications. And in many instances, the specifications of one program varied greatly from those of another.

Kapur accused these managers of spending entirely too much time "reacting to fires" instead of supervising the specifications aspect of the programming chore. If they had kept a check on specifications, standardized the writing or installed an automatic writer, productivity could have been increased by at least 30%, he maintained.

Prototypes Neglected

The study also revealed that all of the organizations surveyed neglected to develop any sort of standard programming prototypes, such as preconstructed diagrams, code shells, I/O interfaces or reusable common functions. By adopting a "Heathkit" approach to programming, using prefabricated programming modules, productivity could be boosted by at least 15% to 20%, he claimed.

Since most of the software defects and problems occur at the design stage (according to previous studies by IBM, TRW Corp., Mitre Corp. and Nippon Electric Corp.), Kapur blamed management rather than down-in-the-trenches programmers for the bulk of productivity snags.

In an interview with 35 managers, he found that most did not have any sort of personal improvement system, involving an accessible library of reading material or a dependable group of peers that could be contacted for management advice. In addition, they often lacked basic communications skills and the ability to make accurate employee appraisals. And

(Continued on Page 24)

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Most Firms' DP Centers Seen Vulnerable to Abuse Despite Safeguards, Laws

By Tim Scannell
CW Staff

SAN FRANCISCO — Despite sophisticated electronic safeguards and an increased number of state-level computer crime laws, most companies' data centers are still very vulnerable to computer abuse. In fact, in some cases these companies may be as guilty of the actual crime as the computer criminal, Susan Nycum, an attorney and noted authority on "that phenomenon known as computer abuse," said here last week.

While computer crime legislation has come a long way from the "wrist-slapping" days of 10 years ago, when the closest things to computer laws were the same laws that prohibited obscene telephone calls, the legal wheels still have far to turn, Nycum told an early-morning audience of data processing department heads at the Data Processing Management Association's (DPMA) International Conference and Exposition.

Nycum gave a brief history of computer crime legislation and painted a bleak picture of future systems security.

Plus Side

On the plus side, Nycum related that 15 states across the country have adopted some kind of law prohibiting the unauthorized use of computers. The strongest of these laws exists in Florida, a state that previously held the unofficial title as a computer criminal's paradise because of its lack of appropriate laws.

In addition, on the federal level, although the government has no omnibus forbidding computer abuse, it does have no less than 40 statutes that directly or indirectly attack computer crime. And the courts have finally recognized that computer products and services, and even some software, are tangible properties, Nycum said.

So, why aren't computer crime investigators and lawyers smiling? Well, for one thing, most computer crime laws have yet to be tested. Although many have been brought into play to catch computer thieves, most alleged criminals have confessed before the laws could actually see their full day in court. And the ones that have not turned over all their cards have been prosecuted on a federal level by statutes covering mail fraud, electronic funds transfer abuse or copyright protection, she noted.

Hard Definition

What's worse, while lawyers and judges have been haggling over exactly what a computer is and how it can be protected, digital theft is becoming harder and harder to define. For example, if a person is caught transporting a computer printout containing some trade secret, then he can be convicted under the statute protecting trade secrets. However, if that person is caught looking at a CRT screen containing the image of that trade secret — which is essentially an electronic impulse — more

than likely he will not be convicted of having committed a computer crime, according to the security expert.

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pert.

To the Justice Department, an electronic impulse "is neither fish nor fowl or good red herring," Nycum

(Continued on Page 24)



Susan Nycum

CW Photo by T. Scannell

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Attorney Claims DP Centers Open to Abuse

(Continued from Page 23)

said. To prove that a computer crime has been committed "would take a clever argument and a clever judge."

Adding fat to the fire, the quest for solid computer crime legislation has reversed the finger pointing, putting the companies that may have been the victims of computer crime on the prosecuting hot seat.

Victims Sued

In at least two cases, companies have been accused of violating the Foreign Corrupt Practices Act and sued for not establishing adequate safeguards against computer crime, Nycum pointed out.

One case involved the Securities Exchange Commission, which sued

to recover damages for people who lost money in a bogus company and check writing scheme, and the other was initiated by shareholders of a corporation who did not want to bear the brunt of that firm's negligence in hiring someone who eventually used a computer to steal at least \$50 million.

In the latter case, the shareholders not only accused the company of being negligent, but of failing to discover the crime until it was too late and for trying to cover it up once it was discovered, Nycum said.

In both instances, the victims were deemed responsible for at least "some of the bad acts of its rotten eggs," she added. Under the so-called "deep pocket" rule, the courts

decided that since a company goes on making money after a crime, it can afford to pay for the losses that are not recoverable, the security expert said.

Stemming the Tide

Managers could help stem the rise of white-collar computer-related crime by:

- Knowing their employees and insisting on detailed checks of their background.
- Knowing who they are promoting, making sure that their experience and integrity fit the new position.
- Removing criminal opportunities, such as a readily accessible code or privileged files.

• Insisting on internal hardware and software controls.

• Using an external auditing source.

• And finally, once it is all set up, keeping a vigilant watch on their people.

Study Shows Output Plunged

(Continued from Page 22)

these managers did not communicate with the upper executive echelon, Kapur noted.

"Managers are technically competent, but don't know how to handle human beings," he explained. "These people are fond of computer resources specifically because they don't kick back."

Four Plateaus

Kapur pointed out that there are four plateaus of good management and programmer productivity improvement.

The first plateau, which results in a productivity improvement from 5% to 25%, involves using either structural code, high-level languages, interactive tools or terminals or frequent reviews and programming inspections.

The second plateau consists of combining the various programming technologies mentioned above and supporting that structure by carefully selecting the programming staff. This formula will usually result in a productivity improvement of from 25% to 50%, he claimed.

The third level of programming nirvana — comprised of a band of what Kapur calls "mucho-macho programmers" — involves acquiring a staff of totally superior programmers capable of writing reams of error-free code. Unfortunately, these people are usually impossible to find, he said. The next best thing, and one that will result in a productivity improvement of from 50% to 75%, is to use consistently program generators, standardized functional modules and very low starting points in a project.

The latter point is important because it is often disastrous if a manager lets his programming staff jump into coding too quickly. There are consecutive barriers to overcome that can work against you if they are skipped, Kapur claimed.

Finally, the fourth and final plateau means using both program generators and standard functional modules to construct a program. This can result in more than a 75% improvement in programmer productivity, he said.

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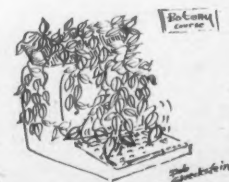
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To Serve or Replace Workers? Futurist: AI Will Simplify Manager's Job

By Brad Schultz

CW New York Bureau

SAN FRANCISCO — Today's truck drivers may be tomorrow's DP managers, a Sperry Univac staff futurist told the Data Processing Management Association's International Conference and Exposition here last week.

Much of what DP managers and systems professionals presently do for a living will be greatly simplified

by systems with artificial intelligence (AI), Earl Joseph said at a conference session. As AI technology develops and wafer circuits replace semiconductor chips as the building blocks of computer hardware, machines will be marketed as replacements for humans with so-called blue-collar jobs, Joseph predicted.

Research already in progress may lead to driverless trucks, for example, ending jobs behind the wheel for thousands of teamsters, Joseph speculated. But AI and coming hardware will also reduce the skills necessary for performing many functions associated with DP management, creating opportunities for job-threatened

workers — such as truck drivers — to take on those functions, following a modest training period. In this way,

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At DPMA**

the Teamsters Union could wind up as the bargaining agent of tomorrow's DPs, he declared.

Joseph noted that systems endowed with cognitive capabilities, including powers of inference and extrapolation, will basically be "people amplifiers," extending the range of

functions that humans can fill or control.

In less than two centuries, various technologies have changed America's work force from predominately agricultural to mostly laborers to the present situation, where a majority accumulate, process or distribute information. Information technology, therefore, has far-reaching social impacts that systems professionals should try to understand, he said.

As a field of computer science, AI aims at creation of systems that emulate the human intellect, drawing on information stored in computer memory and interactions with exter-

(Continued on Page 26)

Circuits Bred Like Cattle?

By Brad Schultz

CW New York Bureau

SAN FRANCISCO — By the end of this century, computer circuitry may be grown and bred like Hereford cattle or American Beauty roses.

Computer technology is helping to establish genetic engineering as an industry, which may in turn allow computer manufacturers to fashion processors from organic material. So said Sperry Univac staff futurist Earl Joseph at the Data Processing Management Association's (DPMA) annual convention here last week.

According to Joseph, scientists have begun devising methods to express in molecules of deoxyribonucleic acid (DNA) the information presently storable in bits that comprise semiconductor chips. In animals, DNA is known to direct the process by which cells replicate, ultimately determining the composition of living tissue.

If this line of research delivers a good harvest, the chip makers of Silicon Valley will go the way of most village blacksmiths unless they join or emulate the recombinant DNA laboratories presently concentrated near Boston's Charles River.

Genetic Engineers

Genetic scientists have turned into genetic engineers at Harvard University and MIT, Joseph told a DPMA session concerned with artificial intelligence (AI). The fledgling industry of genetic engineering — which promises to allow fast breeding of animals and plants, as well as organic substances with medicinal properties — may spring up as large as the computer industry in the next decade or two, he asserted.

"Recombinant DNA" is a phrase that indicates what generic engineering comes down to: deliberate recombination of DNA molecules. The objective might be control over the gender of a human fetus, the meatiness of a prospective steer, the nutritional value of a wheat sheaf or the composition of a substance believed capable of thwarting disease.

According to Joseph, recombinant DNA techniques may allow computer manufacturers to turn out computer components with unprecedented power in much shorter time frames and with less risk of production flaws. Computer technology, for its part, allows genetic engineers to estimate what may happen when they start growing something.



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DP Managers Told to Act Like OA Managers

By Ann Dooley
CW Staff

WASHINGTON, D.C. — The DP/management information systems (MIS) director must stop acting like a DP manager and start acting like an office automation manager if he wants to be in charge of his organization's office automation policy, attendees at a seminar here recently were told.

Maintaining that the person who oversees office automation strategic planning is even more crucial than the person handling implementation, James Carlisle, president of Office of the Future, Inc., warned that DP managers may be limited by a technologically narrow outlook.

DP/MIS managers have the technical knowledge essential for successfully imple-

menting an OA strategy, according to Carlisle. But many have not yet developed the people skills that are needed in introducing an integrated system to nontechnical users.

Speaking at a seminar on "Office Information Systems," Carlisle warned that DP/MIS managers are frequently too myopic — focusing on one or two issues while not grasping user needs. They concentrate on equipment and cost justification rather than on people, he claimed.

Agent of Change

One of the most important leadership requirements for future OA planners is the ability to act as a change agent, according to Carlisle. An OA manager must be eager to try new techniques — it is self-defeating to wed new technology to old methods and strategies.

An OA implementer must also have an appreciation of human factors, knowledge of the management culture, a willingness to learn new technologies and an ability to work with and support people. A keen business sense is also needed, especially if the organization wants to write off a new system over the short term.

Carlisle believes that a director of strategic planning should not fix strategy, but rather help management to understand the limits of its

control and define immediate choices and directions. A strategic manager must have a knowledge of the organization's past, present and future goals and also develop an understanding of the problems as well as the solution technologies, he said.

A long-term effort by management and support staff must be implemented from a top-down level, according to Carlisle, who noted that this effort may call for rethinking policies and procedures, involve new organization structures and focus on people effectiveness rather than technology selection alone.

Establishing direction should be the first phase of planning involving setting up steering committees and task forces comprised of technicians and sophisticated users, Carlisle said.

Management must also be involved in the planning and operations control and consist of project teams and systems and services management. And feasibility studies backed by management support should be used to identify problems that can be solved in a cost-effective manner.

The strategic planner must juggle a number of variables without dropping any, he noted. Items such as definition and communication of objectives, selection and mix of products, manufacturing and marketing, organization

of people and responsibilities and human resource development policy must all be addressed.

In addition, the strategic planner faces the problem of working with a user who frequently has goals that are unformed, change constantly, are influenced by system limitations or knowledge and are rarely communicated to the developer. Getting users to try new technology is a difficult task and requires patience and user training, he noted.

In planning, only the first few steps can be defined in advance with any degree of accuracy because changes will continually occur and each phased step also takes longer than expected, Carlisle remarked.

The office automation planner should focus on changes that affect the global environment, industry environment, organization, product groups and underlying technologies.

Pundit Reads AI Future

(Continued from Page 25)

nal objects. Like human children, AI systems must learn about the world in order to behave well. In years to come, DP managers will occasionally supervise development of such systems and need to decide when a particular system is "mature" enough for release into society, he said.

DP managers should prepare for an "era" of "expert systems" that may begin around 1985, Joseph maintained. Expert systems will advise highly skilled professionals who tackle complicated problems. Several expert systems, implemented as pilot projects, already help physicians diagnose patients, engineers analyze complex structures and scientists study the composition of genes.

The knowledge and reasoning power of an entire department of management information systems may eventually be found in an "ethnotronic system," which Joseph described as comprised of many wafer circuits, individually equivalent to hundreds of today's most powerful mainframe computers.

Many of tomorrow's systems chiefs, he indicated, will enter other occupations without regret as information technology comes to trivialize what humans must do to control development and application of that technology.

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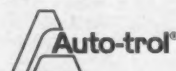
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Specialist Sees Japanese Data Show as Catalyst

By Peter Bochner
Special to CW

TOKYO — While tens of thousands of people jammed the Japan Data Show here recently to view computer equipment and systems, an elite group of less than 300 recently gathered at Keijanren Hall across town to imagine what kind of computers data show attendees will see in the 1990s.

More than 250 computer scientists and system designers from 13 countries participated in the international conference of fifth-generation computer systems, organized by Japan's influential Ministry of International Trade and Industry.

"What kind of computer we have in the 1990s will be decided here," predicted Masahiro Yamamoto, a research specialist at Nippon Electric Co., Ltd.'s computer system research laboratory and a member of the fifth-generation computer committee.

Practical Computer

That computer will be the product of many countries' expertise, according to conference chairman Tooru Moto-Oka. He is also a professor in the Department of Electrical Engineering at the University of Tokyo. In his keynote speech, Moto-Oka called for joint research by all countries to design the computer that will be "most practical and suitable" in the 1990s.

Should the conference fulfill Yamamoto's expectations, however, the fifth-generation computer will have a heavy Japanese influence.

Of the 256 preregistered conference attendees, 175, or 68%, came from Japanese companies, universities or research organizations.

The next highest represented country was the U.S., which sent 38 of its natives to Keijanren Hall. IBM (seven) and DEC (four) employees were the most conspicuous.

Three scientists from the People's Republic of China attended the conference, but no systems designers from the USSR came.

The predominance of the Japanese in attendance and the four Japanese speakers the first day made one member of the audience stand up and ask whether the fifth-generation computer would be a product of international cooperation. Moto-Oka assured him the conference's purpose was to "see what kind of system should be created through the discussion of the participants here."

But, as Moto-Oka pointed out in his keynote speech, perhaps no other country in

the world has a more vested interest in its national information processing capability as does Japan.

Because the country suffers from a shortage of land and natural resources, it cannot achieve self-sufficiency in providing its people with food. Among developed countries, Moto-Oka said, Japan's ability to supply her own energy and oil ranks lowest. Japan, however,

"does have one precious asset: A highly educated, diligent and top-quality labor force," Moto-Oka said. In effect, according to the keynote speaker, Japan's natural resources are her people.

But in 10 years, Japan will change from a predominantly young society to one more aged than European countries — a sudden jump made possible by its high population. In such a society, Moto-

Oka urged, computers can play the important role of improving health care, providing lifetime education to the aged so they do not become obsolete and prolonging their work span by allowing them to perform their jobs at home.

Therefore, many conference sponsors view the gathering as a move vital to Japan's survival, as well as to the progress of computer

technology. By promoting the conference, Japan will play a leading role worldwide in the field of computer technology development, according to Moto-Oka.

"This effort will not only help our computer industry foster more creative technology, but will also provide our country with a means of bargaining power."

Bochner is L.A. bureau chief at Computer Business News.



Three-Speed Systems

Speakers Speculate on Fifth-Generation CPUs

By Peter Bochner
Special to CW

TOKYO — Just as drivers shift the gears of a car to change speeds, so may users soon shift a three-speed computer, depending on the complexity of the problem to be solved.

And just as future cars may not gulp down gasoline, computers 10 years from

now may not use programs.

But these are just possibilities speakers at the recent international conference on fifth-generation computer systems admitted, as they kicked off the conference's opening day with a series of papers aimed at shaping the paths of computer design.

Because fifth-generation computers will evolve ac-

cording to society's needs, it is unlikely they will resemble computers today in their architecture.

"No conventional definition exists of fifth-generation computers. We can only say that they will not be an extension of gradual improvements over current computers," Kazuhiro Fuchi of Japan's electrotechnical

laboratory said.

"The next state will be a leap forward rather than just an extension," he added, explaining that the need for such a change stems from current operator dissatisfaction with computers that are hard to use.

In fact, fifth-generation computers should be like air, Hajime Karatsu of Matsu-

shita Communication Industrial Co., Ltd. said. "They should be able to be used by anyone, unlike today's computers, which, if a mistake is made, often cease to function."

Different Architectures

Both Fuchi and Hideo Aiso, head of the Department of Electrical Engineering at Keio University in Japan, stressed the need for fifth-generation computers to be architecturally different from their predecessors. Computers cannot yet make maximum use of natural communications, such as graphics and speech, Fuchi noted.

Fifth-generation computers cannot resemble those of today because difficulties in developing software and the large amount of software already produced make it very hard to introduce new architectures into existing computers, Aiso said.

But architecture must change. "Fixed architectures pose the danger of blocking the sound development of information technology as a whole," said Tohru Moto-Oka, chairman of the main committee for fifth-generation computers and keynote speaker. Moto-Oka is also a professor in the Department of Electrical Engineering at the University of Tokyo.

To accommodate changing software, system designers must remain flexible in choosing computer architectures. Such changes often result from proposals to improve software productivity, some of which, he noted, have been incorporated into high-level programming languages: modularization, data abstraction and func-

(Continued on Page 30)

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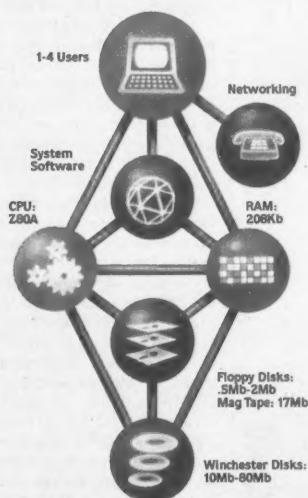
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Speakers Speculate on Fifth-Generation Iron

(Continued from Page 29)
tional, nonprocedural and single-assignment languages.

As the overview speakers went on, the fifth-generation computer began to materialize as very large-scale integration (VLSI)-based redundant processing using natural programming languages and intelligent man-machine interfaces.

Imagine a system with

three levels of computers, the first of which is a "super personal computer" — a high-performance VLSI computer. Should a job exceed its ability, the user can invoke a Level 2 "service machine," which would in turn consist of user service machines to process user programs, machine service machines to take care of communications networks and distributed data bases and control ma-

chines to control the system program and the system.

According to Aiso, Level 3 will be either a dedicated or shared machine, connected to Level 1 and Level 2 machines via tightly coupled lines or loosely connected communications networks.

Fifth-generation computers will use a very high-level language called either a kernel language or core language, Aiso predicted. A

type of logic programming language, it will serve as a nucleus of the software systems and a fundamental specification for the computer architecture.

All four speakers agreed that VLSI technology will be widely implemented in fifth-generation computer systems. "To achieve a quantum leap in the computer technology of the future, it is essential to introduce LSIs

[large-scale integration] and VLSIs fully into computer technology," Moto-Oka said.

"Although these devices have been smoothly introduced into memories, evolution of storage systems in which a logic and memory are combined, such as an associative relationship, will be of great importance."

Both Moto-Oka and Aiso recommended making substantial software efforts in implementing VLSI computer-aided design systems that would include an evaluating simulator and a test data preparation system to achieve error-free design.

Fifth-generation computers will be further determined by the confluence of design objectives and user needs. According to Moto-Oka, the four design objectives are: improving the man-machine interface, increasing the intelligence of the computer so it can comprehend the environment, to expand the kinds of information available through computers and to widen environments that computers can simulate.

The user needs for the fifth-generation computer will be ease of use, the ability to make logic decisions, flexibility in terms of being upgradable and handling quantities of data, easier programming and reliability.

Bochner is L.A. bureau chief at Computer Business News.

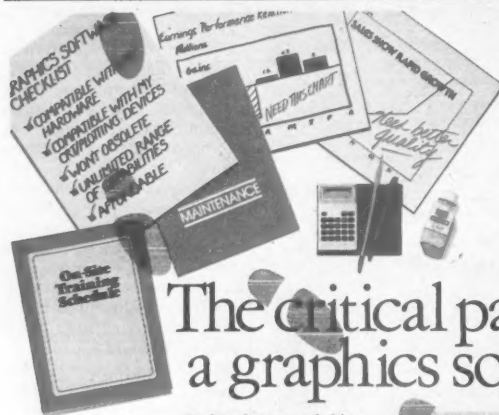
Study: Users Opt For Digital PBX Over Stand-Alone

CAMBRIDGE, Mass. — Preliminary statistics from a Yankee Group study on digital voice messaging systems indicate 66.2% of respondents prefer digital voice messaging capabilities available through an enhancement to a private branch exchange (PBX) rather than a stand-alone system.

According to the Yankee Group, the stand-alone option is currently the only method of performing digital voice message system (DVMS) functions and was the preference of 6.8% of respondents. In addition, 2.7% of the initial respondents preferred the acquisition of DVMS functions through a service bureau.

The firm said annual revenue of at least \$15 billion will be diverted from common carriers as a result of user savings due to the elimination of uncompleted telephone calls and the holding of low-priority messages to off-peak hours.

The Yankee Group is located at Harvard Square, P.O. Box 43, Cambridge, Mass. 02138.

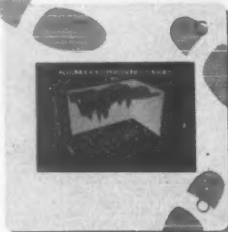


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The critical path to better understanding



Managers on the Move

BURTON MAHONEY has joined Times Fiber Communications, Inc., an affiliate of Insilco Corp., as the director of management information services (MIS).

In his new position, Mahoney will have corporate responsibility for systems development, programming services and DP operations. He comes to Times from the Threading Tools Division of TRW Corp. in New Haven, Conn., where he was MIS manager. He has also worked for the Wallace Murray Corp., Colt Firearms, and American Akzona.

Mahoney holds a B.S. in business management from Northeastern University. He is also president-elect of the Connecticut Chapter of the Association for Systems Management.

...

DONAVON DOWNHAM has been appointed manager of information systems at the Detroit Diesel Allison (DDA) division of General Motors Corp.

The information systems group includes the DDA data center in Indianapolis and has staffs in that city and Detroit. Downham will oversee this center along with an operations research staff and all office automation system planning.

Downham earned a B.S. degree in mechanical engineering from Michigan State University. He joined GM in 1954 as an experimental engineer at the former Detroit Diesel Engine Division. Since that time he has held numerous sales and engineering posts including assignments in Turkey and in New York.

...

GEORGE REMETA has been appointed vice-president of development and technical services at A&P Co., Inc.'s Information and Administrative Systems Department in Montvale, N.J.

In this new post, Remeta will head up computer systems development and systems technology as well as telecommunications. He was previously director of management information systems computer operations and has been with A&P since 1970.

...

EMMETT ZAHN has been named vice-president of systems at The Chicago Board Options Exchange.

Zahn's experience in DP includes running his own consulting firm, Front End Systems, Inc., in Clearwater, Fla.

Zahn is a recent graduate of the University of South Florida, where he earned a B.A. in business and finance.

...

JOHN O. GRAYBILL has been promoted to vice-president of Transit Casualty Co., a property/casualty subsidiary of Beneficial Standard Corp. based in Los Angeles.

Graybill was responsible for forming Transit's new information systems department earlier this year. As director, he oversees information systems processing and development, including information systems planning, systems analysis, computer programming, information systems, computer processing and prep-

aration of related documents.

Prior to joining Transit in April, he worked as a management consultant specializing in DP. Graybill received a B.S. degree in operations research and statistics and an M.B.A. from California State University, Long Beach.

...

HENRI E. LESUEUR, former vice-president of Philadelphia Life Insurance Co., has joined Columbia National Life Insurance Co. in Columbus, Ohio, as vice-president of management information services (MIS).

During his 13 years with Philadelphia Life, Lesueur planned, implemented and directed all hardware, software and application systems.



Burton Mahoney

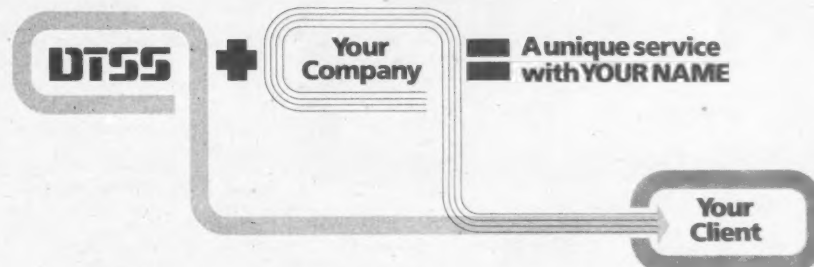


Donavon Downham

Earlier, he served as a consultant/programmer for Huggins and Co. and worked for eight years at Prudential Insurance Co. as both an underwriter and procedures analyst.

Lesueur holds a B.S. degree in commerce and finance from the University of Toronto and has done post-graduate work in management at the American College.

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Northrop MQM-74C Chukar II target is launched from U.S. Navy's Pacific Missile Center in Point Mugu, Calif.

Remote Pilot Training Demonstrated in Desert

By Robert Batt

CW West Coast Bureau

SAN DIEGO — A new computer-controlled system designed to train fighter pilots in combat techniques has been successfully demonstrated in the Arizona desert, it has been revealed here.

Cubic Corp., specialist in electronic defense systems, claimed a simulated technique used to monitor and plot air-to-air combat could significantly reduce the cost of training fighter pilots.

The announcement comes at a time when the Reagan administration has admitted that it is considering cutting down on projected defense increases as a way to balance the federal budget.

Target Droning

The new system, known as target droning, is the latest addition to the Tactical Aircrew Combat Training System/Air Combat Maneuvering Range developed by Cubic Corp. for the U.S. Navy in the 1970s. It was demonstrated for the first time last month and featured an oversized unmanned model airplane (a drone) being controlled by a trainee fighter pilot 60 miles from the launching pad.

The demonstration, designed for trainee pilots of high performance aircraft such as the F-15 and F-16 bombers, took place at two separate locations. Using computer technology, the drone took off from Saddleback Mt., Ariz., and its 25-minute flight was controlled by a pilot at the Marine Corps Air Station in Yuma, Ariz.

Ted Clowes, software engineer at Cubic Corp., explained, "The idea is to use a drone, controlled by a trainee pilot, to fly against a regular pilot as if they were in actual air combat. At the moment, you usually have to put two or more pilots in the air to train a third pilot. Using our system, however, you can pit a more experienced pilot against a trainee and at the same time give the trainee more information than if he were actually in the air. Obviously drones are cheaper to run than actual combat fighters."

According to Cubic Corp., the key to target droning lies in the software, with two-thirds of the research and development which went into the project being software-oriented. Assembler, Fortran and PLM — the microprocessor version of PL/I — are the main languages used.

Cubic claimed that using software, the system can select a view for the trainee pilot on the ground as if he were actually sitting in the cockpit.

The system also contains a replay capability and display pictures may be regenerated so the student can witness his own performance after the mission, including additional scenes not observed during the actual mission.

"A great deal of complicated software is required in getting the right kind of displays for the trainee pilot on the ground. The problem is how do you give him the right amount of information without flooding him with data," Clowes said.

"At the same time, the system can tell him things about the aircraft he would never know as a pilot in the air, for example, his position relative to other aircraft and his closing velocity relative to another aircraft," he added.

All the information is stored in the system's computer processors (normally Perkin-Elmer Corp. 832s), including such items as air speed, altitude and the angle of attack. Other data such as the name and rank of the trainee, weapon used, type of aircraft, firing results and range status can also be viewed.

Cubic Corp. has also developed an electronic warfare system, designed to counter antiaircraft attacks.

The system was developed at the request of the U.S. Navy and the first laboratory demonstration took place in San Diego in September.

If a December demonstration is successful, Cubic expects to begin shipments in 1983-84. The long time lag is due to the lead times needed to bring in aircraft and modify them to accept the new system. The new model uses a PE 832 for the control and computation subsystem and tracking instrumentation, and an Adage 330 for graphics displays.

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Focus on Self-Service

Bank of America Shifts Gears With Automation

By Jeffery Beeler

CW West Coast Bureau

SAN FRANCISCO — The Bank of America's processing work load truly befits an organization with the distinction of being the largest bank in the U.S. Each night, an estimated 10 million to 20 million transactions pour into the financial institution's two main batch computing centers, one in San Francisco and the other in Los Angeles.

To trim its staggering paper processing burden and minimize its traditionally heavy reliance on costly human labor, the Bank of America has embarked on an effort to automate many customer transactions and is also shifting its focus to self-service banking.

The bank's push to automate its operations has manifested itself in at least two important developments. First was the installation of a network of on-line teller terminals geared solely for internal use that reportedly streamline high volume transactions.

Second, Bank of America put in place some 150 statewide automated teller machines (ATM) through which customers can gain on-line access to their accounts and perform routine banking functions like making deposits to checking and savings accounts, transferring funds between accounts and checking account balances.

Together, the teller terminals and ATMs account for up to two million of the transactions processed daily by the bank's two main data centers, each of which houses six 12M- to 16M-byte IBM 3033s or 3033MPs running under MVS.

Better Customer Service

The teller terminals and ATMs have also enabled the bank to boost its level of customer service and at the same time hold down its overhead, according to Peter Hill, vice-president in charge of information technology.

But in order to retrieve all of a depositor's Bank of America records as a single package, the bank was forced to restructure its existing data base by logically linking the individual's separate accounts through the company's customer master file.

The move to redesign the bank's data base is already well under way and "will probably reach its first milestone next year when we finish integrating all our deposit account data bases," according to David Shepard,

the bank's senior vice-president of information services and systems.

After completing its work with the deposit account data bases, the bank plans to shift its attention to integrating the loan data bases as well.

Not surprisingly, the ambitious plans to revamp its customer data bases entail a tremendous amount of internal

software development. So about 18 months ago, efforts to increase information systems productivity were stepped up.

The key to Bank of America's productivity improvement effort is its revised systems methodologies. Like many other large mainframe users, the bank some time ago began to expand and up-


grade internal project methodologies to include widely used conceptual tools of the trade like structured design, analysis and programming techniques.

But while structured methodologies "tell you a whole lot about the application you're trying to provide, they tend not to be too helpful in the area of data base

design or to be particularly useful if you're trying to create a large, integrated data base," Shepard said.

"So at the same time we've been introducing our staff to structured techniques, we've also been reexamining the work we've done with applications and tried to come up with our own methodology

(Continued on Page 34)



Before the Northrop F-5G gets off the ground, it has to fly on a Harris computer.

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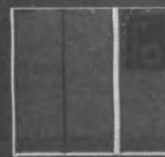
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HARRIS

Cpeug Meet to Focus on Productivity

SAN ANTONIO, Texas — The Computer Performance Evaluation Users Group (Cpeug) will focus on "Increasing Organizational Productivity" at its 17th meeting here Nov. 16-19.

The group encompasses professionals involved in improving federal DP

facilities.

Cpeug 81 will feature Norman S. Zimbel, distributed systems manager for Arthur D. Little, Inc., as keynote speaker. His speech is entitled "Business Automation and Productivity — Fact, Fiction and Prediction."

There will be three parallel sessions

and office automation will be among new areas given special attention. Track A will address performance-oriented management throughout the life cycle.

Track B will concentrate on special technologies and analysis tools/techniques important to good performance and productivity.

Track C will consist of tutorials and case studies offering familiarization and training in the major areas addressed in the other two tracks.

The registration fee is \$85 and there is an optional conference summary luncheon Nov. 19 for \$10. More information is available from Theodore F. Gonter, U.S. General Accounting Office, Room 6011, 441 G St., N.W., Washington, D.C.

Cbema to Meet Tomorrow

WASHINGTON, D.C. — The Annual Government Procurement Conference of the Computer and Business Equipment Manufacturers Association (Cbema) will be held here tomorrow, Nov. 10.

David Kearns, president and chief executive officer of Xerox Corp., will be the keynote speaker.

The conference theme is "Synchronizing Government and Industry Processes to Keep Pace with Commercial Information Technology." There will also be panel discussions.

It is for Cbema members and their guests only and there is no registration fee, Cbema said from 1828 L St., N.W., Washington, D.C. 20036.

Bank of America Shifts Gears

(Continued from Page 33)
for designing data bases."

With the help of outside consultants, Bank of America has already finished conceptualizing its data base design methodology and is now well on the way to implementation.

This methodology owes much of its underlying philosophy to the teachings of internationally known author and lecturer James Martin, who urges user companies not to develop applications or data base management systems (DBMS) until they have stepped back from their organizations, analyzed their corporate information flow and systematically charted that flow.

'Top-Down' Approach

"Basically, we've taken a top-down approach to the problem of designing data bases," Hill explained. "We've asked ourselves what our key businesses are and tried to understand how all our information — including records for checking accounts, savings accounts, loans and credit services — moves within the retail portion of the bank.

"Finally, we've created an overall information architecture that attempts in a very global fashion to define the logical views of data that any given application might need."

Hill credited the bank's home-grown information architecture with giving software developers a framework within which to create new applications.

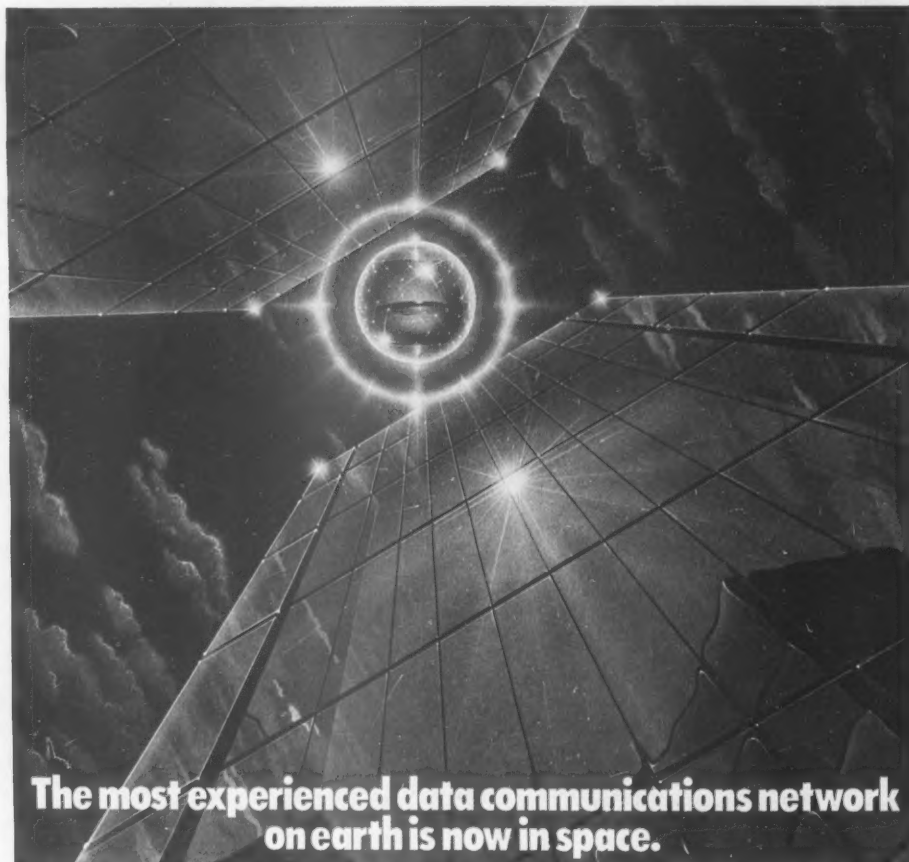
The architecture provides the bank's analysts and programmers with a kind of reference point for creating individual applications, he said.

The first step in building a new system is to take an incoming business requirement and produce data flow diagrams representing the application's functional flow.

At the same time, a designer lays out the intended application's logical views of data. This logical design work is done without regard to the type of DBMS the bank will ultimately be using.

Next, the bank's systems designer "relates the new application back to our overall information architecture," Hill said. "In this way, each application we bring forward for development is placed in some kind of context that we preserve when we go about implementing our next application."

In effect, then, Bank of America updates its information architecture every time it adds a new application.



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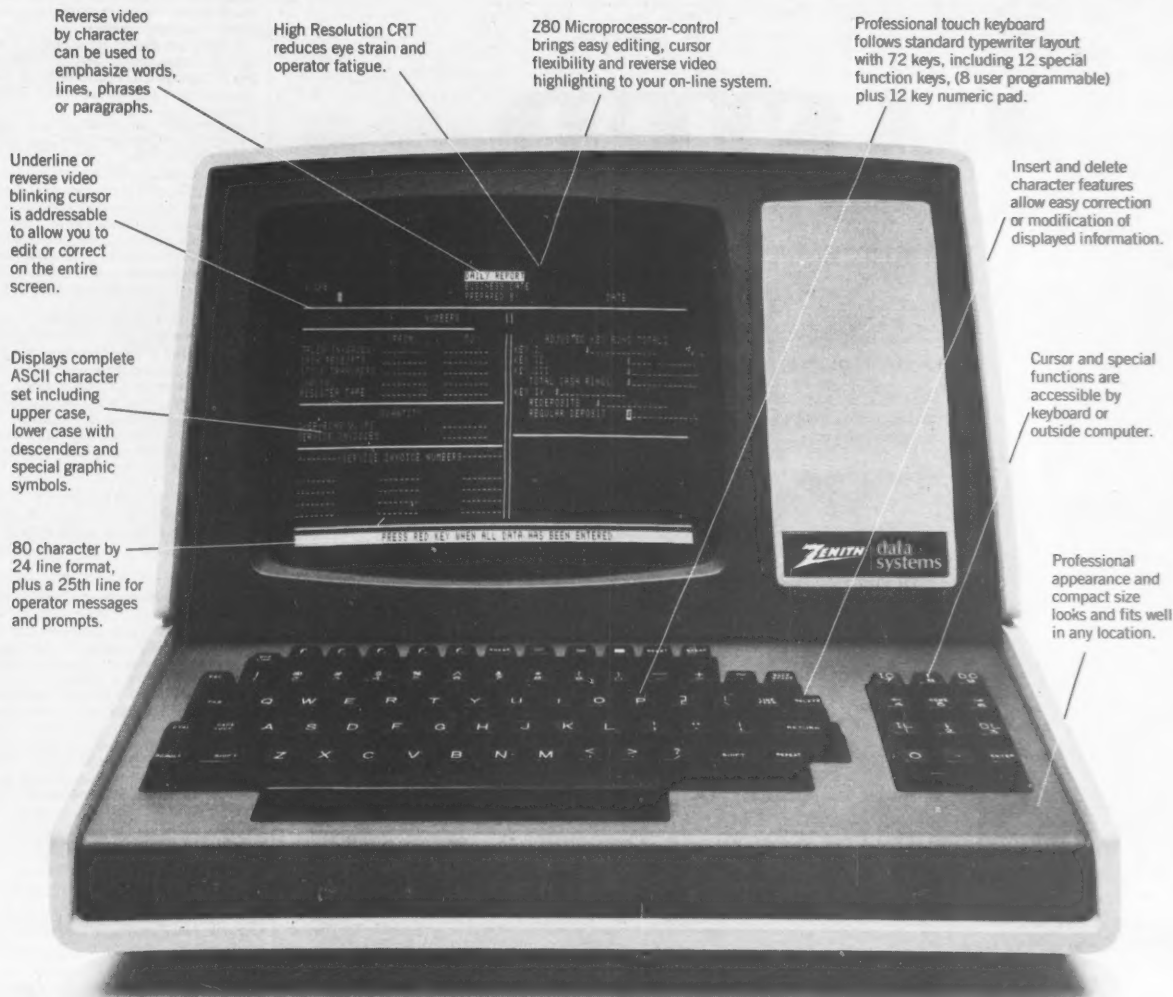
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Call for Papers

EXPO 82 ELECTRONIC BANKING CONFERENCE & EXPOSITION, Los Angeles, March 28-31, 1982.

Papers and reports on all aspects of electronic funds transfer are now being solicited for presentation at the conference. Outlines are due by Dec. 1 and applicants will be notified of acceptance shortly thereafter.

The final paper may be of any length and printed copies must be submitted at least one month prior to the conference. All correspondence should be directed to BMA Western Chapter, c/o The Bankers Institute, 21 Tamal Vista Blvd., Corte Madera, Calif. 94925.

FIRST ANNUAL OFFICE SYSTEMS RESEARCH ASSOCIATION (Osra) CONFERENCE, San Francisco, April 4-5, 1982.

Topics of interest for paper submission include planning and conducting research projects, case studies, office automation overview, behavioral implications of automation, relative university curricula, white-collar productivity, work place design, data gathering and analysis techniques in office automation research.

Papers should be in for consideration no later than Dec. 11, to Jan Duffy, Conference Chairman, Suite 202, 663 Yonge St., Toronto, Ont. M4Y 2A4, Canada.

THE 1982 SCIENTIFIC CENTER FOR BUILDING TECHNIQUES INTERNATIONAL (CSTB) SYMPOSIUM, Paris, June 1-3, 1982.

The theme of this event will be the technical, economic, and social aspects of DP and cybernetics in building. Specifically, the symposium

seeks papers on automated production management in the factory and on the work site, computer-aided design, management of fluids and energy, teleprocessing, home computers and data networks and other relevant issues.

Papers should be sent to M. Trouslard, CSTB, 4 Ave. du Recteur Poincaré, 75782 Paris Cedex 16, France.

THE 1982 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS' PATTERN RECOGNITION AND IMAGE PROCESSING CONFERENCE, Anaheim, Calif., June 13-17, 1982.

There will be two categories of presentations at this conference, based on long papers (up to 6,000 words) and short papers (up to 3,000 words). Papers are being sought on all aspects

of pattern recognition and image processing, including enhancement and restoration, image data base management, special purpose hardware, medical imaging; map DP and computer vision and robotics.

Four copies of papers should be submitted by Jan. 25, 1982, to Dr. Richard Kruger, Los Alamos National Laboratory, Los Alamos, N.M. 87545.

21ST ANNUAL ASSOCIATION FOR COMPUTING MACHINERY/NATIONAL BUREAU OF STANDARDS TECHNICAL SYMPOSIUM, Gaithersburg, Md., June 17, 1982.

"Computing and Government: Interactions and Achievements" is the theme of this symposium. Papers are being sought from all branches of local, state and federal government as well as industry and academia on large systems, software design, personal computers, computer crime and reliable systems.

Authors are invited to submit five double-spaced manuscripts by Jan. 12, 1982, to Program Chairman Eric Elsam, Bolt, Beranek and Newman, Inc., 1300 N. 17th St., Arlington, Va. 22209.

WORKSHOP ON AUTOMOTIVE APPLICATIONS OF MICROPROCESSORS, Dearborn, Mich., Oct. 7-8, 1982.

This event is being sponsored by the Industrial Electronics Society of the Institute of Electronics and Electrical Engineers and endorsed by the Convergence '82 Conference Committee. Papers are being solicited on engine control, drive train control, diagnostics, instrumentation and display, safety systems, entertainment systems, test equipment and plant process and quality control.

Two copies of double-spaced summaries of 300 to 400 words should be sent by Feb. 15, 1982. The summary should define the purpose of the work and should be suitable for a 20-minute presentation. Notification of acceptance will occur on Nov. 15, 1982. Correspondences should be addressed to John Neuman, Technical Program Chairman, General Motors Research Labs, Electrical Engineering Department, General Motors Technical Center, Warren, Mich. 48090.

MELECON '83: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS' REGION 8 MEDITERRANEAN ELECTROTECHNICAL CONFERENCE, Athens, Greece, May 24-26, 1983.

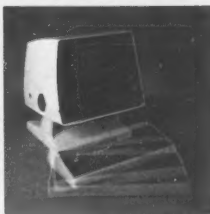
Energy and information systems with special emphasis on applications of interest to Mediterranean countries will be the focus of this conference. Papers are being sought on solar energy and electric power systems, communication systems and relevant computer applications.

Prospective authors should submit three copies of titles and 200-word summaries for consideration, in English, along with name, address, telephone, telex number and affiliation, by Sept. 30, 1982. Notification of acceptance will be Nov. 30, 1982. Correspondences should be addressed to Prof. E.N. Protonotarios, National Technical University, 42, October 28th St., Athens 147, Greece.

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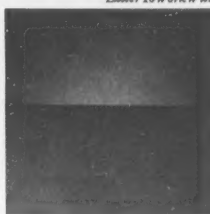
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OTA Sees Federal Policy at Risk

Study Warns Policymakers to Focus on DP Issues

By Jake Kirchner

CW Washington Bureau

WASHINGTON, D.C. — Society will not be able to take full advantage of the growing number of national computerized information systems unless federal policymakers focus more attention on the emerging issues related to computer usage, warned a major congressional study released last week.

The Office of Technology Assessment (OTA) said, "There appears to be neither a strong trend nor sentiment at present among policymakers in favor of a uniform federal information policy that would encompass all the problems that could arise from the many possible uses of data systems."

The OTA study, "Computer-Based National Information Systems: Technology and Policy Issues," said "there is a lack of focus on information policy as such and consequently the emerging issues are not being directly addressed."

OTA commented that "continuation of the present situation could inhibit many socially desirable applications of information systems or could create even more intractable policy problems in the future."

The report, the product of several years of research, is intended, OTA said, as a "broad introductory examination" of national information systems and related public policy issues Congress is likely to face over the next few years.

It was also planned as the foundation for further OTA study. Nearing completion are related reports on the policy implications of three major uses of computer-based information systems: the criminal justice systems of the FBI's National Crime Information Center, electronic message services planned by the U.S. Postal Services and national electronic funds transfer (EFT) systems.

Directed at Policy Issues

The report released last week, OTA said, was directed at the policy issues raised by a variety of public and private sector systems, including the FBI systems, the Federal Reserve's EFT network, the Federal Aviation Administration's computerized air traffic control system, nationwide computer-based credit card and check authorization services and the Defense Department's military command and control systems.

"As these computer-based systems become more and more important to American society, particularly for government administration, they create corresponding public policy issues," OTA noted.

The study identified and discussed more than a dozen areas of law and regulation that affect information systems or are affected by them, including: privacy, freedom of information, various constitutional rights, communications regulation, proprietary rights (patent, copyright and trademark), antitrust, taxation, government provision of information and government procurement of information systems.

"There are numerous laws and regulations, some overlapping or actual-

ly conflicting, that directly and indirectly affect the operators and users of information systems, the consumers of information services and the subjects of personal information data banks," the study said.

Noting there is no movement toward a uniform information policy, OTA said it was not suggesting "that there is or should be a single, uniform policy governing all the uses of information systems in both the public and private sectors. In fact," the study said, "no such policy exists, nor does one appear to be likely."

OTA did suggest, however, "the need for consideration of the currently confusing array of laws and

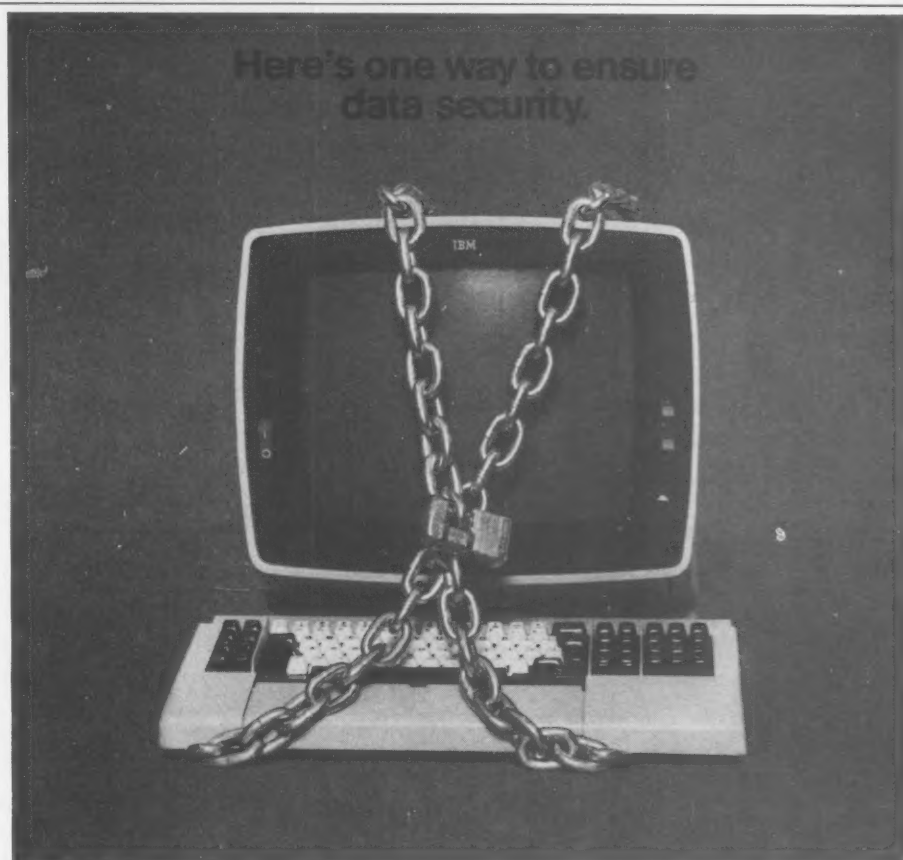
regulations — and their strengths, overlaps, contradictions and deficiencies — within some overall policy issue structure or framework."

The study examined in depth the national issues expected to be most important and likely to warrant congressional attention during the next few years:

- Innovation, productivity and employment.
- Security. Protection of government computer systems will become a more important subject as agencies, both civilian and military, increase their already considerable dependence on computer systems.
- Government management of data

processing. The government is losing opportunities to use the latest technology for greater efficiency and effectiveness, while overburdened support systems and antiquated management procedures lead to increased costs. OTA also noted there are potential societal questions related to increased automation of the bureaucracy.

- Society's dependence on information systems.
- Constitutional rights.
- Regulatory boundaries. National information systems raise numerous questions about federalism, interstate conflict of laws and antitrust, OTA noted.



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ACM Issues Two Reports on Gaps In Computer Curricula at Junior Colleges

By Bob Johnson

CW New York Bureau

NEW YORK — Responding to DP and education professionals' dissatisfaction with current training programs, the Association for Computing Machinery (ACM) recently released two reports that focus on DP education in programming and computer and data entry operations at the junior college level.

Called "Recommendations and Guidelines for an Associate Level Degree Program in Computer Programming" and "Recommended Curricula for Data Entry Operations and Computer Operations Personnel," the reports are expected by ACM to fill an information gap the society feels exists in the nation's computer academia.

According to the society, a number of its members, especially teachers, felt that although there was a proliferation of computer science/DP curriculums available at the community college level, most did not carry the appropriate weight and had no firm ground in DP.

The two studies culminated four years of research, ACM said. Ac-

cording to Joyce Currie Little, chairperson of the ACM Committee on Curriculum for Community and Junior Colleges, the reports represent the first effort of a scientific society to provide curriculum recommendations for computer personnel at this level. Little said: "The recommendations were designed to prepare students for entry-level jobs in applications computer programming, data entry operations and computer operations and aim to ensure a sufficient foundation for graduates to advance in any of a wide variety of career paths."

When asked how a change in the education of entry-level personnel could benefit the DP manager, Little said that if the manager is aware that the colleges he deals with have this type of curriculum then he knows he has a valuable resource to tap.

"People in this type of program that the ACM is recommending can become more successful in their careers because of the concentration of study. In addition, their training period in any installation will be that much less because they are already familiar with a good deal of what's

going on" and will really only have to learn the shop's equipment.

The reports contain basic technical information and at the same time prepare students to work in the volatile computer field, which the ACM said "is not easy." Criticizing the lack of good DP training, the operations report stated, "Few institutions even claim to incorporate both of these objectives in their DP programs. The ACM continued by quoting a statement that claimed many of these programs do not reflect the needs of the industry. "Part of the problem is due to the sudden and rapid growth of these educational programs without proper time for planning goals or developing philosophies," the report said.

Industry Needs

Included in the reports are sample course outlines, a list of texts, references and job descriptions with guidelines for school administration, instruction and equipment requirements. According to ACM officials, industry needs were taken very seriously in developing the reports.

In the introduction of the report on programming, for example, it states that guidelines are given to assist educational institutions to design a curriculum to meet the needs of local industry. The report also said that due to rapid developments in computers in the 1980's, programmers will have to change their work styles with regard to microcomputers, time-sharing and remote job entry stations. "The increased maturity of the field has led to a more standardized vocabulary, better defined job tasks and a generally accepted body of knowledge and skills required for competence," the report stated.

In the area of computer operations education, in which 250 industry and educational representatives were questioned, the report stated that very little has been produced to help institutions establish good programs for operator training. "One major survey of courses offered in higher education did not gather data on operations courses," it added.

The ACM acknowledged that training and education for operators has been almost nonexistent. "What training there is usually occurred on the job, at the hands of another operator. This 'follow-me-around-and-do-what-I-do' type of training reflects the present trend to educate on the job," the report said.

Both reports can be obtained from the ACM Order Department at P.O. Box 64145, Baltimore, Md., 21264.

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The Rules of the Salary Game

Q After three years in my first and only DP position, I've received top performance reviews and pay raises above the industry averages. I'm reasonably happy, but we have hired three entry-level people close to, and in one case, above my salary.

After putting myself on the block, I've received a very inviting offer with a 25% increase in salary. I talked informally with my immediate supervisor about the possibility of my leaving. Within the week my present employer matched the offer.

Benefits considered, the new job has a slight economic advantage. Any input you might have to this decision would be appreciated.

A You, like thousands of others, are an amateur playing a game with seasoned professionals. But the game is not over and you should know the rules before accepting or rejecting an offer. I find the rules created by a seller's market objectionable, but rules are rules.

It seems the most popular corporate management information systems' recruiting strategy is to get the most (not necessarily the best) for the least. The industry has adopted a system of barter where one seldom accepts the first or, in many cases, the second offer. An individual's potential for corporate contribution is often overlooked to accommodate the corporate recruiting strategy.

The game is not over until you are duly compensated for your worth. How you play the game is a matter of personal preference, but you must make a concerted effort to determine the value of your services. Don't expect any help.

Q I'm very much interested in the chief programmer team concept mentioned in one of your earlier columns. I would appreciate knowing more about it.

A The team is formed to accommodate the hierarchical modular development of programs. Top-down design is paralleled in the team organization.

The basic team consists of a chief programmer, assistant chief programmer, librarian and up to four programmers. The chief programmer identifies the modules (of no more than three person/weeks each) in a hierarchical manner, writes the job control and "driver" program(s) and assigns and supervises the development of subordinate modules.

The assistant or backup chief programmer maintains an overall knowledge of the project and does production programming. The librarian's functions may include maintaining the documentation library, assisting in program testing and monitoring test file status. Programmers should have a range of skill levels.

Q I am a field engineer for a firm that markets, installs and maintains software-based, IBM-compatible 3270-type remote and local cluster controllers, terminals and printers. In the course of travels, I am frequently in

large computer sites and have become interested in telecommunications systems networking and design.

Would you please tell me first, what kind of background in hardware/software is required for entry into such a position? Second, what would be the most direct route to such experience? Third, are the various professional seminars in networking worth exploring? Fourth, can you recommend a course of study?

A In answer to your questions: First, thousands of degree-holding applicants with similar aspirations have made a bachelor's degree, and in some cases a

master's degree, a prerequisite. Those without degrees and holding such positions have advanced through the ranks via on-the-job training and supplementary professional training.

Second, if you do not have a degree, perhaps the most direct route would be a small company needing your hardware experience and willing to provide growth opportunities for you in telecommunications. The less direct route is formal study.

Third, attendance at networking seminars will always be a plus, but should be supported by experience to be of any value in the job market. Fourth, the obvious recommendations are computer science or information systems; however, check the

Turnaround Time

By Larry E. Long

program very carefully to insure that telecommunications and networking is part of the course of study.

Long is a professor at Lehigh University, a DP consultant and author. If you have a question you'd like him to address, send it to Larry Long, Editorial Department, Computerworld, P.O. Box 880, Framingham, Mass. 01701.

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Want to Swap Data on 8100?

SPRINGFIELD, Ill. — The state of Illinois IBM 8100 user group is interested in exchanging meeting minutes and other information with similar groups across the country.

The Illinois group was formed little more than a year ago and includes seven data processing shops, representing an installed base of about 20 8100 systems. The emphasis of the group is on IBM's DPPX operating system.

More information is available from Dwight Garmon, State Employees Retirement System, 2815 W. Washington, Springfield, Ill. 62702.

EFTA, Electronic Money Council Merge New EFT Association Announced

WASHINGTON, D.C. — The Electronic Funds Transfer Association (EFTA) and the Electronic Money Council have merged to form the new EFT Association.

Howard Mandelbaum, associate chairman, said the organization is the single trade association representing the views of the EFT community on national and international issues relating to EFT legislation, regulation, operations, technical standards, security and education.

The association will have an expanded committee structure, which will encompass the activities of both merging organizations and will include six committees: Strategic Policy Planning, Government Regula-

tions, Operations, Corporate Payments, Marketing and Security. Further information is available

from EFT Association, Suite 800, 1029 Vermont Ave. N.W., Washington, D.C., 20005.

Seminar to Examine Influence Of IBM, Vendors on Industry

SANTA MONICA, Calif. — A four-day seminar that will examine the effects that moves by IBM and other vendors have on the computer industry and on everyday management tactics will be held this month and next in Chicago and New York by Technology Transfer Institute (TTI).

Scheduled to take place Nov. 30-Dec. 3 in Chicago and Dec. 7-10 in

New York, the seminar was designed for both managers and computer end-users. It is divided into two segments. Day one, which involves an executive summary in business terminology, will offer a discussion of management philosophies and schemes; days two through four will consist of a more detailed examination of the effects recent technical eruptions have had on management styles.

The cost for the first day only is \$295 while the cost for the three succeeding days is \$695. However, the registration fee for the entire four-day package is \$895, according to TTI.

TTI is located at 741 10th St., Santa Monica, Calif. 90402.

Group Formed For AED Users

SUNNYVALE, Calif. — Advanced Electronics Design, Inc. (AED) has established a group for users of its AED512 full-color raster graphics display system. Membership in the group is free.

Members receive a free subscription to the group's newsletter, access to a library of user-submitted computer programs and software for support of the AED512, along with information about applications for the system from other members, the firm said.

Robert Holzman of the Jet Propulsion Laboratory is president of the group and Thomas Ferrin of the University of California is vice-president.

The next meeting of the group will be held at Siggraph '82, July 26-30 in Boston. Further details can be obtained from Robin Ratajczak of AED at 440 Potrero Ave., Sunnyvale, Calif. 94086.

Cibar to Start College Division

COLORADO SPRINGS, Colo. — Cibar Systems Institute, Inc. has announced it will open a college division in January. The program will be an off-campus computer science program for students attending liberal arts colleges.

Courses are arranged in a block plan with the calendar year divided into 12 segments, 3½ weeks each, according to the firm. Students will have access to a Digital Equipment Corp. PDP-11/70, a Hewlett-Packard Co. HP 3000 Model 44, an IBM 370/158 and several microprocessors and personal computers, the firm said.

Courses cost approximately \$475, the firm said from 2850 W. Serendipity Circle, Colorado Springs, Colo. 80917.

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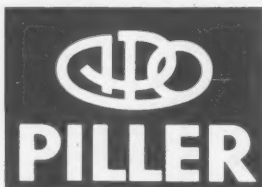
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Missouri Co-op System Keeps 'Em Down on Farm

COLUMBIA, Mo. — How do you keep people down on the farm once they've discovered computers? The Missouri Farmers Association (MFA) solved that problem by bringing computers to the farm.

The MFA, a farming cooperative based here, uses a minicomputer-based integrated network architecture system to handle its grain order-entry system that is presently located in 94 remote areas throughout the state. Designed by Digital Communications Associates, Inc., the system includes computers, statistical multiplexers and a variety of other communications equipment, a spokesman said.

Farmers use the system to exchange their grain for capital. Eight Texas Instruments, Inc. 990 minicomputers located here in Columbia, each supporting up to 32 communications ports are the heart of the exchange. The computers are locally connected to two System 355 master network processors and six trunk lines run from each of these processors to the 94 points throughout Missouri, he explained.

Multidrop Feature

Each trunk link supports from two to 11 statistical multiplexers multidropped off the link at different rural sites. The multidrop feature reportedly reduces the number of modems and leased lines otherwise needed to access each terminal and printer. In a conventional point-to-point connection, two modems and one line are required to communicate with a terminal or port from the host computer, according to the spokesman.

Each System 355 processor can support up to 124 ports. However, at the moment, MFA is utilizing 112 ports divided between the two System 355s. Ninety-four of these ports consist of a System 105 statistical multiplexer, which is a microprocessor-based device that serves as a slave unit to the 355, according to the spokesman.

In an effort to keep the lid on maintenance costs, MFA is using the System 355's built-in diagnostic capabilities to automatically test all hardware and network functions from a central point of control over the entire distributed communications network, he said.

The MFA's entire network costs about \$250,000 and can be expanded by adding extra boards into the slave multiplexers as the need arises, the spokesman added.

Workshops to Cover Computer Literacy In Higher Education

NEWARK, N.J. — The Electronic Information Exchange System, headquartered at the New Jersey Institute of Technology, will offer 10 courses on the use of the computer as a tool in higher education.

Participants will be members of the administration and faculty of an ad hoc consortium of 11 colleges, all of whom will participate at their own institutions in workshops directed toward the improvement of computer literacy and computer applications to higher educational methods, according to a spokesman.

Course material will vary from applications to the teaching of advanced statistical analysis, with course costs funded by a two-year grant from the U.S. Department of Education fund for the improvement of post-secondary education, the spokesman said.

Further information is available from the New Jersey Institute of Technology, Office of Public Affairs, 323 High St., Newark, N.J. 07102.

On-Line Data Bases Up 25% in '81

SANTA MONICA, Calif. — The number of on-line data bases that can be accessed through computer terminals is continuing to grow rapidly, according to Cuadra Associates, Inc., publishers of the

Directory of Online Databases. The fall 1981 directory lists more than 960 data bases available to the public — a 25% increase over the number available one year ago.

The Directory of Online Data-

bases is published quarterly and provides coverage of bibliographic and non-bibliographic data bases accessible through on-line, interactive systems. A one-year subscription, which includes two complete editions and two updates, costs \$60. Two-year subscriptions are offered at reduced rates.

Further details are available from Cuadra Associates, Inc., Suite 12, 1523 Sixth St., Santa Monica, Calif. 90401.

Publication Sizes Up IBM, Radio Shack Micros

CHERRY HILL, N.J. — Radio Shack must now face competition from IBM's new Personal Computer in computer retail outlets across the country.

In *Small Business Computer News*, a monthly mini- and microcomputer review published by Management Information Corp., Radio Shack's TRS-80 and IBM's Personal Computer are evaluated for the prospective purchaser. The significant features of both products are compared and contrasted in the 15-page supplement to the yearly subscription service.

The evaluation is available for \$24 from the publication

at 140 Barclay Center, Cherry Hill, N.J. 08034.

Davis Awarded Professorship For MIS Studies

MINNEAPOLIS — The Honeywell Chair in Management Information Systems (MIS), the first academic professorship devoted to MIS, has been awarded to Prof. Gordon B. Davis by the School of Management at the University of Minnesota.

The academic chair was funded by a grant from Honeywell, Inc. The objective of the chair is to carry out an active program of teaching, research and service in order to advance the performance of MIS and foster understanding of the opportunities and challenges of these systems.

Davis is the author of 14 texts and numerous articles in MIS, computer DP, programming and DP auditing.



'First You Tell Me How Much You Can Afford for a Computer, We'll Have a Good Laugh and Go on From There.'

Book Lists Top DP Execs

PHOENIX — Applied Computer Research, Inc. (ACR) has announced the release of its semiannual *Directory of Top Computer Executives*.

The Fall 1981 edition lists more than 8,350 top computer executives in industry and government in the U.S. and covers more than 7,000 computer sites. It is organized geographically with an industry cross-reference; each entry includes the company name, address, subsidiary and/or division names, type of industry, phone numbers, computer systems installed and the names and titles of key DP executives.

The directory costs \$95 or \$150 for an annual subscription. Additional information is available from ACR through P.O. Box 9280, Phoenix, Ariz. 85068.



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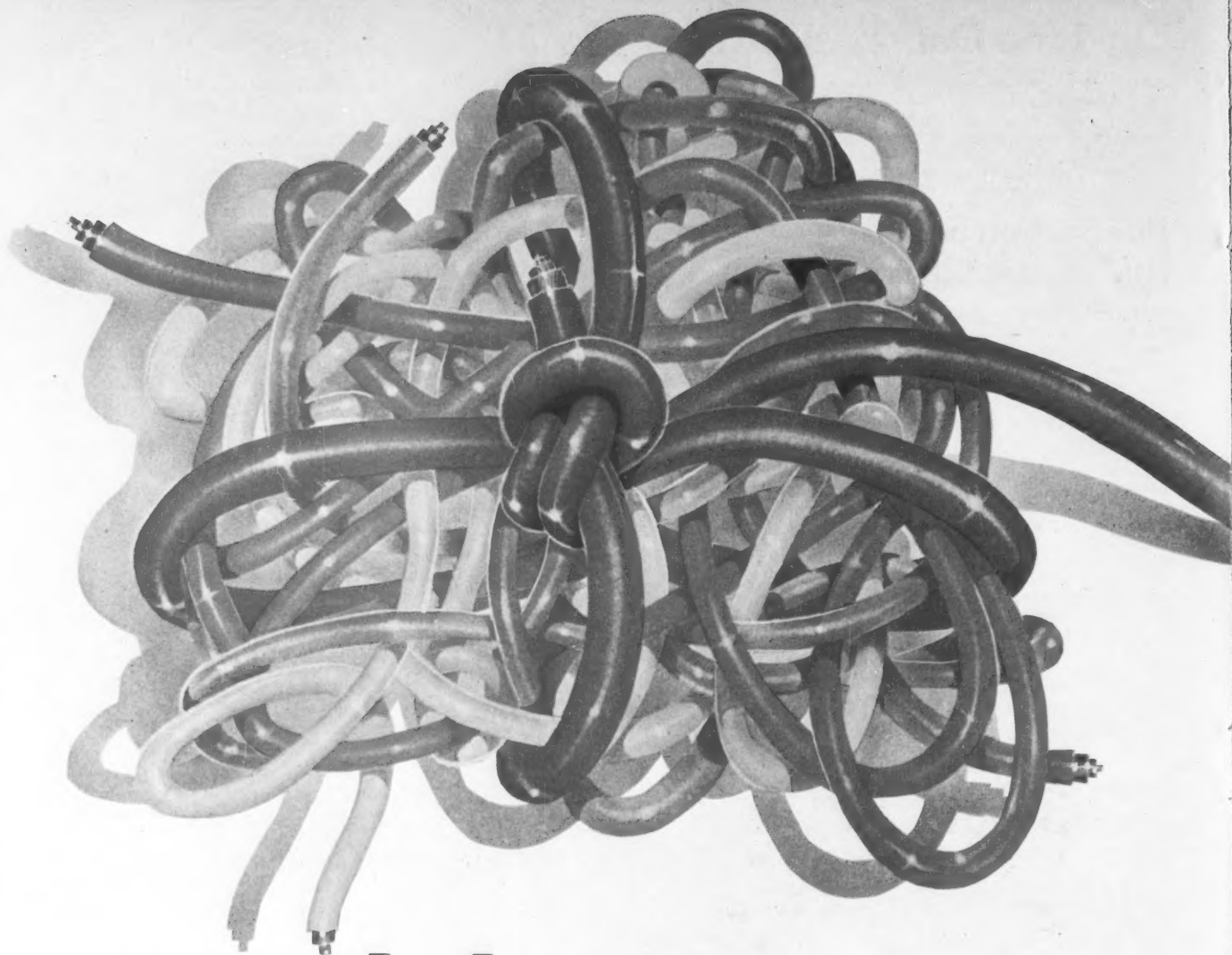
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COM System Solves Bank's Growth Dilemma

HARRISBURG, Pa. — When Commonwealth National Bank here tripled its assets over a 10-year period, the result was a corresponding expansion in the number and size of computer-printed reports required for operations.

Producing these reports in paper form created increasing problems from the standpoint of information availability and records storage for the bank.

"The solution was to automate," according to James A. Nitz, vice-president of the information and services group in the Operations Division. "A bank can grow only by adding personnel or automating operations to enable existing personnel to become more efficient."

To help with that automation, Commonwealth installed a computer output microfilm (COM) system from 3M Corp., through which it claims to have greater availability of information, more efficient operations and reduced paper and storage costs.

Growth Problems

Before installing the COM system, the bank realized it had outgrown its storage capability for records in paper form. It had even been forced to rent off-premise warehouse space for records storage, a spokesman said.

The master list of daily transactions was another problem. Produced in four- or five large books of paper computer printout each day, this list had to be used by tracing and adjustment personnel on a shared basis, resulting in delays and inefficient operations, he noted.

The bank investigated COM as the means to eliminate problems with paper computer printout. Although Commonwealth had previously utilized an outside COM service bureau to produce a microfiche of monthly statements, it opted to install an in-

house system to meet the time-critical nature of demand deposit account trial balances and master listings.

Based on an investigation of four COM systems, the bank installed a 3M System 710 COM unit and a 571 Duplifice System.

Nitz said the primary consideration in selecting 3M equipment was service availability because fast service from a local office "was an extremely critical factor in our selection."

Another important consideration was the system's dry operation, which he said results in consistent quality with minimum maintenance while eliminating the use of wet chemicals in computer areas.

The COM system is now being used to produce microfiche of demand de-

posit account trial balances, master lists, several transaction journals and time deposit trial balances, all at reduced costs, he said.

Serving 120,000 demand deposit accounts and 172,000 time deposit accounts including 52,000 certificates, the bank's system operates six days per week, two shifts per day. The system processes 19 computer tapes a day.

"Availability of information is greater now because we're able to economically and efficiently produce more copies of trial balances and journals," Nitz said. "For example, we now produce 72 microfiche copies of demand deposit account trial balance in comparison to four paper copies. We produce eight micro-

fiche copies of the master list in contrast to one paper copy. And we produce 23 vs. two copies of transaction journals."

John S. Nourhold, unit manager of bank services in the general services and support department, predicted continuing expansion of COM operations in the future. "We'd like to get to the point where any reports of any sizable nature are put on COM," he said. "This is particularly true for large reports, which must be stored."

Commonwealth is planning to expand COM operations to include other demand deposit account and time deposit reports as well as mortgage, commercial and installment loan reports, Nitz noted.

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With Flexible Modular System Wells Fargo Gallops Into Cash Management

SAN FRANCISCO — Although its name evokes images of covered wagons and early settlers, Wells Fargo Bank recently began operating a computerized cash management service to provide its customers with the latest technology to manage their cash positions.

Wells Fargo was one of the first West Coast banks to offer computerized cash management services. "However, we realized we needed a more flexible, modular reporting system that could expand and change as our markets grew," Paul Beehler, vice-president of corporate cash management services, recalled.

The package the bank chose is In-

formation Express, which operates on General Electric Information Services Co.'s (Gisco) teleprocessing network. It is designed to provide bank customers with a means to transfer money, make investments and fund certain accounts, based on up-to-date information reported through the on-line centralized system.

He noted that Information Express was developed by the vendor in six months to meet the bank's changing requirements.

In addition to a balance report, Wells Fargo's information service includes a target balance report, lock box details, detailed debits and credits and float analysis reports. It also

features domestic money market rates and foreign exchange rate reports and an intraday activity report.

Beehler said the intraday activity report posts account transactions that have occurred during a given business day. It also prints out preliminary balances so that customers can see how their financial position is changing each day. Currently, the updates are completed in the morning and at noon. If customer demand is sufficient, a mid-afternoon update also will be added to the service.

The system features detailed balance reporting at both Wells Fargo branches, as well as other banks throughout the world, Beehler add-

ed. This capacity allows a company's subsidiaries to maintain full control of local accounts, while corporate cash managers maintain centralized cash control.

"Our customers have a great deal more flexibility now in formatting their reports to meet unique corporate requirements," he said. "We are also in a much better position to meet their requests for new reports or for changes to existing reports."

Wells Fargo's sales consultants also advise customers on how to set up their own cash management systems.

Before choosing the cash management system, the bank's corporate cash management services staff met with other banks as well as with key customers to develop an in-depth market analysis. "We wanted to incorporate the latest techniques in cash management and designed our system to take into account our customers' present and anticipated requirements for this service," Beehler said.

Middle Market

The bank also developed its new system with a middle market in mind, medium-size companies that may not have used automated cash management services previously, he explained.

"Many of the traditional manual interfaces between a bank and its customers have been refined by improved electronic communication of information. Today, many medium-size companies can take advantage of these improvements to improve the timeliness of their cash reports."

Wells Fargo studied several alternatives, Beehler said, including other vendors and in-house systems, before selecting Gisco. "We couldn't afford to tie up our in-house computers for the enormous task of reporting cash management information on a timely basis."

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Electronics Firm Switches to In-House System

OCEANSIDE, Calif. — Switching from service bureau processing to an in-house system has made it possible for ACDC Electronics here to expand processing capabilities while saving money.

The division of Emerson Electric Co., which specializes in manufacturing dc power supplies for the computer and electronics industries, found its subscription to two service

bureaus was three times more expensive than owning a processor.

"It was a matter of economics," according to DP manager Ken Johnson. "We were paying \$24,000 a month for what was essentially batch mode processing and we owned nothing. Some of the general accounting information took as long as four days to turn around. Even our basic inventory and accounts receivable data

took overnight to process in a taped format."

ACDC bought a Hewlett-Packard Co. HP 3000 Series III processor and an MFG/3000 software system from the same vendor. Comprised of four modules, MFG/3000 monitors all data to and from an Image/3000 data base. All data is entered, retrieved and modified through HP interactive CRT terminals, using a preprogrammed form that resembles those typically used in materials planning and control departments.

Expands Communications

Using HP's Query inquiry language, MFG/3000 enables personnel from more than one department to communicate and use information collected from almost anywhere in the manufacturing operation. On-line transaction menus are shown on the terminal screen to guide users in making entries, Johnson said.

"I had my doubts whether an off-the-shelf software package would be of any help to us without an enormous number of modifications. Since the MFG/3000 was installed, however, I've become a believer," he admitted.

Of the four modules in MFG/3000, EDC/3000 (engineering and data control) is used to keep track of every item within the materials inventory, including part numbers, product descriptions, costs bills of material, standard routings and engineering changes, an ACDC representative explained.

Manages Logistics

IOS3000 (inventory and order status) is used to manage actual logistics of all materials and parts documented by EDC/3000.

MRP/3000 (material requirements planning) simulates the flow of materials necessary to meet a produc-



The inquiry language Query allows manufacturing personnel from any department to communicate with and use information from any other department through a CRT terminal and applications software.

tion schedule. By using such information as bills of material, parts on order and inventory status, MRP/3000 can recommend a plan for materials acquisition that will fit the schedule.

The final module, SPC/3000, calculates standard product costs, including material, labor and overhead, for each subassembly, assembly and finished product in a manufacturing operation, the spokesman continued.

ACDC is currently utilizing 16 CRTs to input, modify and retrieve all MFG/3000 and accounts receivable information in its Image/3000 data base. Future plans include adding terminals and controllers to link two more nearby facilities with the HP 3000, Johnson said. Estimating that the in-house processor will handle the firm's processing for three more years, he said that ACDC might opt to add another machine to its hardware configuration at that point in time.

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Insurer Solves Output Woes By Adding In-House COM

HARTFORD, Conn. — When the Covenant Group of insurance companies here decided to replace its aging IBM computer with a more up-to-date system, it had to look beyond simply acquiring a processing means to an output end.

It also had to seriously consider how to present the output which, in this case, consisted of unending mountains of data.

Selecting the computer was actually the simple part, a spokesman recalled. The data center had an IBM 370/168, maintained under a facilities management contract, that was so overloaded with work that some of the group's processing had to be

done on a similar machine at a nearby company. To help alleviate this pressure, Covenant ordered an IBM 4341 computer with 2M bytes of main memory. The 4341 was the first of the 4300 Series to be installed in the area, according to John R. Craggs, manager of the company's computer operations.

The more difficult prong of the firm's two-part decision was whether to bring its computer output microfilm (COM) operation in-house or leave it with the service bureau that had been handling it in the past. Eventually the firm decided to take care of its own informational house-keeping and brought in a computer-output microfiche system.

Cost, Turnaround

Two considerations weighed heavily in favor of bringing Covenant's COM closer to home. One was cost. The service bureau already was costing about \$40,000 a year and rates were going up, Craggs said. The other reason was production turnaround time. The COM tapes had to be ready for pickup by the service bureau so the completed fiche could be returned to the center by 8 a.m. Shortening the microfilming time would allow the computer operators more data processing time, Craggs said.

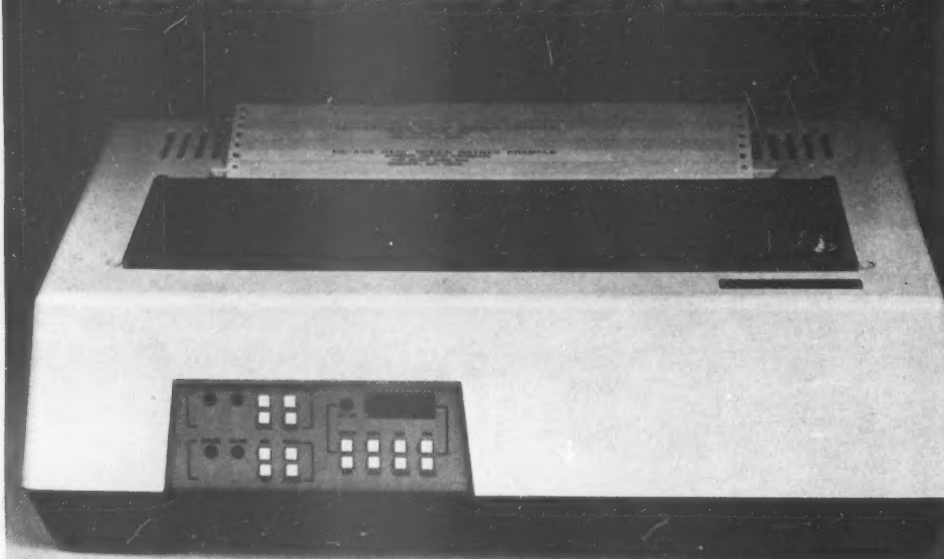
The firm finally decided to purchase a Kodak Komstar microimage processor that could be programmed to operate on-line with the 4300 series computer working under the DOS/OS.

The microfiche unit was delivered one month after the 4341 was installed. Linking the system to the host processor took only a few days and mainly involved updating the computer's unit control word table to accommodate the laser device, Craggs stated.

With the installation of the Kodak equipment, volumes of microfiche production rose steadily. In one five-month period, for example, the total number of frames rose 25%, Craggs noted.

Covenant is also encouraging its programming staff to use the in-house microfiche system for system output work, he said. With the Komstar on-line to the computer, programmers now have the option of printing reports on either paper or microfilm.

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With so many matrix printers on the market today, it may seem tough to find exactly the right one for your application. Some models may offer the speed you need, others the communications flexibility and still others the forms handling capability. But no printer offers all the features you need...until now.

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and many other features may be programmed and stored from the keypad. When your system is powered down, the format is retained in memory. The DS180 even remembers the line where you stopped printing. There is no need to reset the top of form, margins, baud rate, etc....it's all stored in the memory. If you need to reconfigure for another application, simply load a new format into the memory.

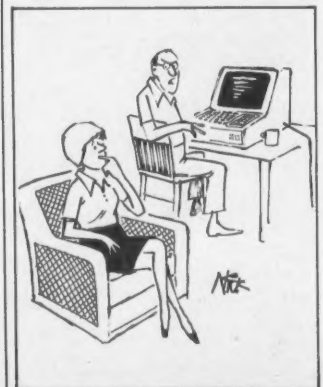
Communications Versatility—The DS180 offers three interfaces including RS232, current loop and 8-bit parallel. Baud rates from 110-9600 may be selected. A 1K buffer and X-on, X-off handshaking ensure optimum throughput.

Forms Handling Flexibility—Adjustable tractors accommodate forms from 3"-16". The adjustable head can print 6-part forms crisply and clearly making the DS180 ideal for printing multipart invoices and shipping documents. Forms can be fed from the front or the bottom.

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Mini on Its Menu

Fast Food Chain Fills Order for Fast Processing

MOBILE, Ala. — Fast food requires fast processing. And that is what Morrison Cafeterias here looks for from its distributed data processing system.

The cafeteria chain utilizes the system to coordinate food offerings at 140 locations and to manage 11 family restaurants and commercial catering services, a spokesman explained.

Northern Telecom Systems Corp.'s Model 445 system was installed to replace key-to-tape devices used for remote job entry (RJE) at four warehouse sites, he said. Since the key-to-tape devices were only capable of "dumb" data entry, it often took hours to discover data entry errors, he noted. Tapes then had to be returned to the warehouse for rekeying.

Other Problems

Additional problems arose when receiving orders from Morrison cafeterias, the spokesman said. Orders were initially taken over the telephone. The order was then read on a paper tape reader in Mobile, converted to magnetic tape and loaded into the firm's host processor for editing.

"We were experiencing a 75% error rate," E.J. Bueche, director of management information services said. Since the method lacked two-way communication, errors usually went undetected, he noted.

Dependence on a local host also caused problems for the company. When Hurricane Fredrick knocked out the system for four days in the late '70s, for example, it had a negative impact on the day-to-day operation of the cafeterias, the firm said.

Morrison decided the solution was a distributed processing system. So the firm evaluated offerings from IBM, Datapoint Corp., Four-Phase Computer Systems, Inc. and Northern Telecom, Inc.

The projected system required interactive Cobol, RJE capability and the ability to

communicate with the firm's IBM 4341 host in Mobile. Northern Telecom's 445 won out because of its interactive Cobol and RJE capabilities, with IBM's System/34 coming in second.

A 445 processor is located at each of four warehouses in Atlanta; Tampa, Fla.; Jackson, Miss.; and Nashville, Tenn. Each system is config-

ured with eight CRT terminals, two 300 line/min printers and 20M bytes of disk storage. A fifth processor is located at the Mobile site for program development, the firm said.

The individual systems maintain complete inventory files on some 1,800 different items and each warehouse supplies approximately 35 of

the 140 cafeteria units, plus local independent restaurants, hotels and food services, Morrison said.

All cafeteria and outside customer units place orders on a predetermined schedule and the orders, usually numbering between 80 and 100 items, are dictated to an order-entry clerk. The system handles billing and shipping

and flags items that are in short supply.

At the end of each day, the warehouse systems automatically print picking documents that listing items in the sequence of warehouse bin location. The lists are corrected as orders are filled and returned to data entry personnel for billing, he said.

The Performance Leader Model 925



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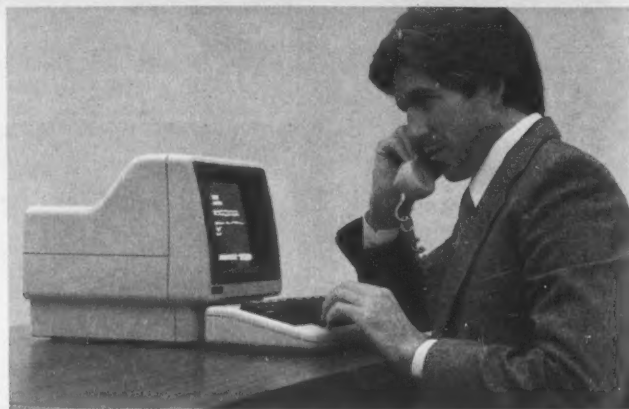
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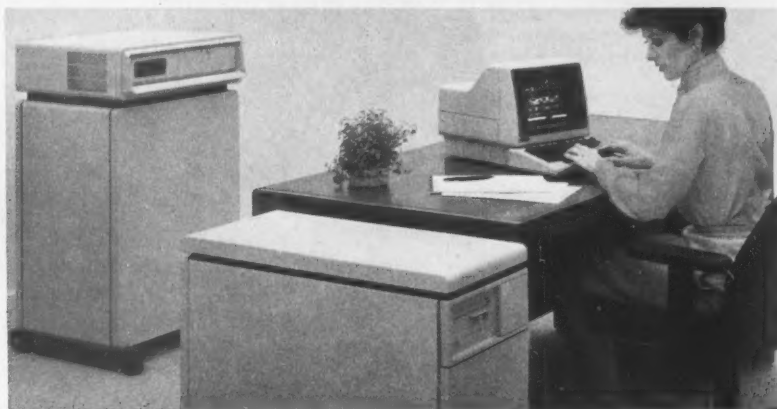
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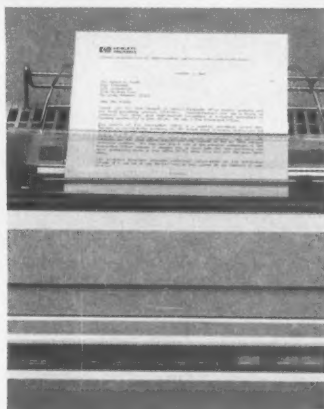
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Bankers Plan Workshop Feb. 7-10 To Study Economic Issues, Trends

LOS ANGELES — James E. Olson, vice-chairman of the board of AT&T, will keynote the 1982 Bank Telecommunications Workshop here Feb. 7-10. The annual event is sponsored by the American Bankers Association (ABA) and addresses economic issues, trends and changes relative to banking and telecommunications.

Special attention will be given to bank telecommunications and the impact of deregulation and also to the acceptance of home banking by the consumer. The conference will include discussions on interconnect, rates and regulations, security and

banking hardware and software.

Conference admission is \$390 for ABA members and \$490 for non-members. Further information is available from Ann Siegel of the ABA at 1120 Connecticut Ave., N.W., Washington, D.C. 20036.

Tutorial Week Program Ready

SAN DIEGO — The IEEE Computer Society is offering the final program for its Tutorial Week West '81, scheduled here Dec. 7-11.

Tutorials are arranged in parallel courses including networks and dis-

tributed processing, software, very large-scale integration and a course on computers for the beginner.

The program is free and is available by writing IEEE at P.O. Box 639, Silver Spring, Md. 20901.

Journal Reports Lawyers Creating Automated Legal Practice Systems

CHICAGO — Computer law specialists have proven that practicing attorneys and their assistants can create their own automated legal practice systems.

As reported in *The American Bar Foundation Research Journal*, James A. Sprowl and Ronald W. Staudt, both affiliated with the foundation, set up a successful system at the Legal Services Center at the IIT/Chicago Kent College of Law. The article traces the researchers' efforts from the project's inception in 1976.

A copy of the report, "Computerizing Client Services in the Law School Teaching Clinic: An Experiment in Law Office Automation," is available for \$2 from the foundation at 1155 E. 60th St., Chicago, Ill. 60637. It can also be found in No. 3 of the foundation's research journal, which is headquartered at the same address.



Who to call:

The IBM 3232 Model 51 is available through nearly 100 dealers across the country. To learn who is nearest you, call one of the distributors listed here.

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The IBM 3232 Model 51 operates not only as a standalone receive printer, but also as a quiet desk-top work station for interactive ASCII comput-

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To make it faster and easier for you to have an IBM 3232 Model 51, we've made it available through our new, authorized distributor network. For the names and locations of distributors, see the list on the left.

IBM

Growth Forced Change

CPU Drives Golf Club Maker Up to Par

LOS ANGELES — The geometric business growth of a golf club here meant installing an automated system to handle internal accounting and management information functions.

A bookkeeping machine installed more than 10 years ago at the Stan Thompson Golf Club Co. worked well when the club had only 350 retail accounts, a spokesman said. But manual methods for processing orders, tracking inventory and monitoring production through the golf club's factory rapidly became outdated.

Club founder Stan Thompson and controller Rick Graff knew a computer system would be needed. After attending a computer trade show and examining the offerings of several vendors, they settled on the Nixdorf Computer Corp. Model 8870 business system, designed for wholesale distributors.

Earlier System Flopped

"We had actually tried another system first, and it didn't work out," Graff said. "Our decision to go with Nixdorf was based largely on its software, because it allowed us to get started right away. We could get our backlog cleared up and begin writing custom application software that would let us expand in the future."

Including a Nixdorf 8870 CPU with 128K bytes of main memory, a pair of 10M-byte disk drives, five CRT/key-board terminals and a 300 line/min printer, the system now monitors all accounting work, order processing,

inventory control and production management activities at the club itself and at an associated golf club's factory, a spokesman explained.

The club's order processing system handles orders, invoices, debit and credit memos, pink slips, backorders or any other pre- or postbilling activity related to a customer order. The inventory system maintains activity reports, stock status and reorder point reports; performs profitability analysis, cost history reports, cost/price change reports; and maintains a physical inventory book, he said.

Accounts receivable management is automatic once an order is entered, with complete case receipts manage-

ment, automatic finance charges, exception reports and receipts journal and general ledger summaries. Sales analysis is provided by customer, item and salesman, and histories can be maintained by customer, salesman and quota. Reports can be produced regularly on customers, salesmen, territories and product classes, he noted.

The major software modifications made by Graff and his staff include a letter-writing program that makes use of the customer data base, a statistical sort package, a production control system, a customer identification system for order entry and inquiry and an automatic shipping la-

bel system based on shipper zone and rate systems.

All software has been written in Basic and 25% of the disk file space is used for application programs, leaving 15M bytes on the two disks for data files. The dual disks are used daily for creating a backup copy of all data files, for disaster protection and archival storage, he said.

"Everybody uses the terminals, either for entry of order, production and inventory information or for querying the data base," Graff said, pointing out that additional growth would probably mean eventually increasing the number of terminals and disk space within the system.

AT McDONNELL DOUGLAS...



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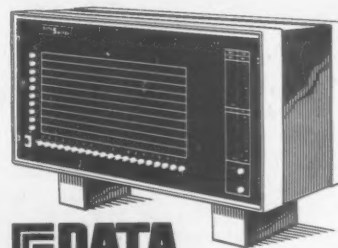
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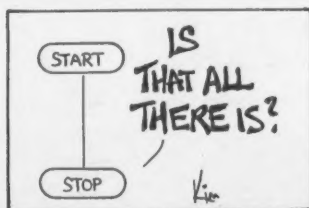
Monograph, Text Focus on OA

WASHINGTON, D.C. — A monograph of 13 management articles and an office automation textbook are available from the International Micrographic Congress.

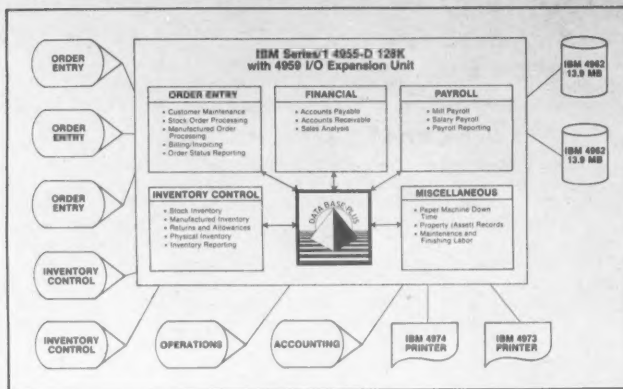
The monograph, "Management and the Challenge of Automation," is published by the Administrative Management Society, with articles focusing on the issues, benefits and risks of new office technologies, including word processing, data processing, telecommunications and records management.

Human Factors in Office Automation is a textbook on the people aspects of office automation. It was written by Wilbert O. Galitz and published by the Life Office Management Association.

The monograph is priced at \$25 (\$30 airmail) and the textbook at \$16 (\$20 airmail) from International Micrographic Congress, Publications Sales, P.O. Box 34404, Bethesda, Md. 20817.



Manufacturer Combines DBMS, IBM Series/1



Sorg Paper Application Systems

MIDDLETOWN, Ohio — The combination of a data base management system (DBMS) from an independent software vendor and an IBM Series/1 minicomputer enabled a manufacturing company here to replace its mainframe and still improve customer services.

Sorg Paper Co. replaced its IBM 360 mainframe with a Series/1 mini in 1979, according to a company representative.

By using an application development system that includes Data Base-Plus, a DBMS from Cincinnati-based Tominy, Inc., Sorg was able to design and implement the first phase of the system within six months, the spokesman said.

Sorg makes and sells specialty pa-

pers for 2,500 U.S. customers. With 600 employees and seven paper machines, it reported sales of \$76 million in 1980.

In less than two years the firm installed all major system components including order entry, inventory control, finance and payroll. The DBMS reportedly provides interactivity among these applications while eliminating redundant information.

Time Reduction

The on-line system enabled the 130-year-old company to reduce the time it takes to provide customer service, track inventory and send out an income, the Sorg spokesman said. It also reduced office space requirements and the number of personnel

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"1st choice, OEM Disk Packs, Datamation "Brand Preference Study," 1979 and 1980.

"All About EDP Media and Supplies," Datapro Research Corporation, September, 1980.

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needed for data processing, shipping and warehousing.

The mainframe system was batch-oriented, which made order tracking difficult, especially when a customer needed an answer quickly. Customers could not be told the full status of their orders unless they had been billed and orders completed.

Now, because of Sorg's on-line system, most customer questions can be answered on the spot, saving up to a week of tracking time in some cases and improving customer relations, the company spokesman explained.

Warehousing Changes

The mini-based system allowed Sorg to change warehousing methods from assigned areas to random-bulk storage. Whereas formerly only warehouse personnel knew where stock was located, now the computer is used to track inventory location, quantity and sales. The system shares that information with the order clerk and with sales people who provide customer service and shipment information.

The minicomputer has improved inventory control as well, according to Sorg. Employees have been able to cut the time it takes to conduct a complete stock inventory. Before, it took eight people six hours; now eight people can count and recount in two hours.

Another benefit of the system is improved billing, the Sorg representative explained. Previously, if the company shipped one day the invoice went out in two days. Now if it is shipped before 5 p.m., the invoice goes out at 10 a.m. the next day.

When the minicomputer and peripherals were purchased, the justification was personnel savings, the company spokesman continued, but the real benefits were in customer relations and inventory control.

Personnel savings were realized because the system requires fewer people to exclusively serve the needs of DP, shipping and warehousing, he said, adding that Sorg was able to reduce the number of employees required by these operations by six. The hardware itself requires less than one-seventh the space required by the old card system.

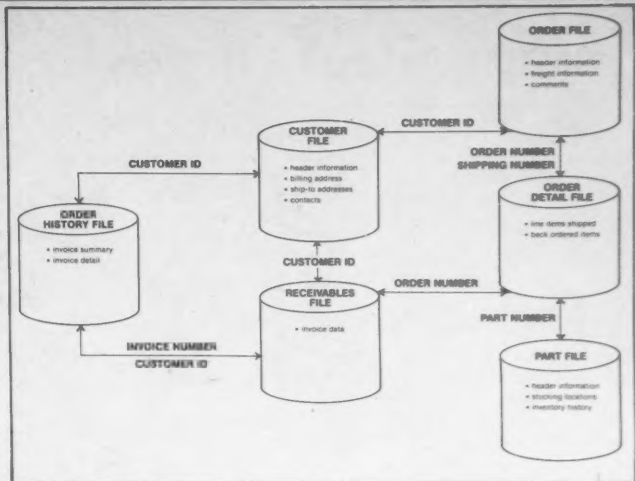
The company planned to buy a minicomputer when it decided in 1978 to buy new hardware. Budget constraints made a minicomputer the only choice, according to the company representative. At first, three systems seemed to suit Sorg's needs, he said, but it was the availability of data base management software that directed Sorg to its choices: an IBM Series/1 4955 Model "D" and Data Base-Plus from Tominy.

With the Series/1, which has 128K bytes of memory, Sorg has installed two 13.9M-byte disk storage units, an I/O expansion unit, seven display stations, one line printer and one

matrix printer. Conversion to the system was accomplished in six months when the order entry system was installed Feb. 15, 1979. Since that time, inventory control, financial, payroll and other miscellaneous applications have been added.

Employee resistance to the new system and the training required was minimal, the spokesman said, because the system was helpful to employees in their work. Display stations were assigned to billing, order entry and accounting.

For Sorg, one of the best parts of the system has been its simplicity, he explained, noting that the company has found it easy to design more than 400 programs to serve its information needs in all areas of operation.



Sorg Paper Data Relationships for Order Entry Subsystem

AT HARRIS HOSPITAL-METHODIST...



DATA SWITCH keeps the Health Care System healthy!

Channel switching and control systems are critical to the computer complex. Harris Hospital-Methodist chose Data Switch because critical situations demand state-of-the-art response.

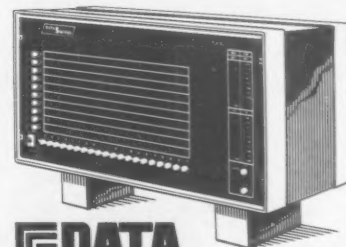
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DATA SWITCH



Inland Steel Forges Cut in Work Order Time

INDIANA HARBOR, Ind. — Inland Steel Co. has increased its data accuracy and reduced time spent on work orders since it shifted from paper to electronics.

Paper work orders have been replaced by electronic work orders displayed on IBM 3270-type CRT terminals manufactured by Harris Corp.'s Data Communications Division of Dallas. At any point in a steel coil's pro-

duction cycle, a worker in Inland Steel's mill can access a huge data base where the coil's up-to-date work order is kept. The Harris 8180 display stations are scattered throughout the steel mill and handle as many as 60,000 to 90,000 transactions daily. Some display stations function 24 hours a day, seven days a week.

The 233 Harris 8180 CRT terminals communicate in

IBM's 3270 mode with two IBM 370/168s and a 3032 in the Indiana Harbor computer center. In their process control applications, the terminals allow Inland to shorten the lead time needed to produce a coil of steel and to rush through badly needed orders, the company said.

Fundamental Components

Inland developed its process control system by break-

ing the production process into its most fundamental parts.

"We found that as steel is manufactured through the plant, there are a number of serial operations that go on," Bill Sanders, manager of manufacturing systems at Inland, said. "In my one department there may be eight, 10 or 12 sequential steps. At each one of those steps, somebody would record

what went on and maybe eight hours later that information would go up to the planners and schedulers in the form of paper reports.

"In our analysis we found that the recording accuracy of each of those steps was poor. What we had was information coming back to the people who were trying to prepare work instructions for the next operation, but the information was neither timely nor accurate. We ended up with the people on the production floor doing the planning instead of the people who were supposed to be doing the planning," Sanders said.

Accuracy at 99%

With accuracy and timeliness as goals, Inland's DP staff developed an integrated production control system which is accessed by the 8180 CRT terminals. The accuracy of the data in the system has improved greatly over the days of paper work orders, until it has reportedly reached 99%. The timeliness of work orders has been improved. It takes only seconds for someone to bring up the work order on the display station's screen and update the information.

"Schedules must be met. Normal production lead times are not always sufficient. You've got to move the steel through fast," said Don Cade, general supervisor for production control at Inland Steel's No. 3 Cold Mill, where about 35% of the company's outbound shipments occur. Cade pointed out that paper copies of production orders are almost nonexistent in Cold Mill No. 3. And the inspectors and workers are not unhappy to see the paperwork disappear.

"We used to have around 50 different people with copies of orders and you had to just hope your copy was up-to-date," Cade said. "Now, there are no handwritten order changes, so we don't lose orders. Changes are done on the display terminals so the orders are always up-to-date. With our computer systems we are able to run a coil of steel through two or three processes in three or four hours. Before we had the CRT terminal on the production floor, it used to take at least a day for each process."

The employees that use the terminals find them indispensable, he said. From management's point of view, an indispensable feature of the terminals is their local format storage (LFS) feature.

With LFS, the CRT terminal is able to store screen formats on diskette or disk at the 8180 system's local controller.

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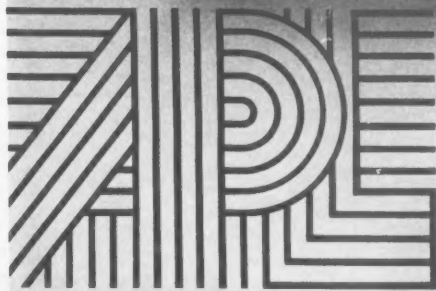
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For Iron Works' DPers

Pregnancy Gives Birth to Home Programming

HOUSTON — Home access to an IBM mainframe computer via IBM 3270 terminal emulation has boosted productivity at Cameron Iron Works here.

Cameron had been making oil drilling equipment since the early 1900s. It is a completely integrated business with its own steel-making facilities, design, manufacturing and marketing units. It also has an extensive DP department with 75 applications programmers.

Recently Murray Cates, the DP and communications manager, added a T-7CM protocol emulator developed by Datastream Communications, Inc. of Santa Clara, Calif. The T-7CM makes it possible for virtually any Ascii dumb terminal to access an IBM mainframe computer by emulating the IBM 3270 terminal line.

Pregnant Programmer

Cates recalled that the T-7CM was used with very good results in the main offices downtown here. But it was not until one of the women programmers became pregnant that he discovered its versatility.

In the past, the woman, like other programmers, had been "on call" at her home at nights and on weekends when something went wrong with one of her programs.

On such occasions, she had to go to the downtown offices, regardless of the hour, make the needed corrections and then drive back home. It was not always convenient or comfortable for her to do that, but it was part of the job of being a programmer.

One day Cates got an idea. He explained to the programmer that she might be able to do her weekend program corrections at home. Cates ordered another Ascii terminal and a couple of modems. The terminal was installed in the woman's den at her home, along with one of the modems and a connection to her phone.

After that, when something went wrong with one of her programs after normal work hours, she would go to the terminal, dial through the modem into the T-7CM and then into the IBM 3270. From then on it was just as though she was in the office downtown. She made whatever corrections were needed and then went back to whatever she was doing when the call came.

The arrangement worked so well that when a second woman programmer became pregnant, Cates immediately ordered the gear for a similar

connection at her home.

Some of the male programmers asked if they could have the same consideration. Cates ordered two more terminals and installed them, then he ordered five more terminals. Today he has nine programmers who can answer programming emergencies from their homes.

The Cameron use does not

surprise Charles Askanas, president of Datastream. When his engineers developed the T-7CM he visualized some innovative changes that it would bring in modern offices.

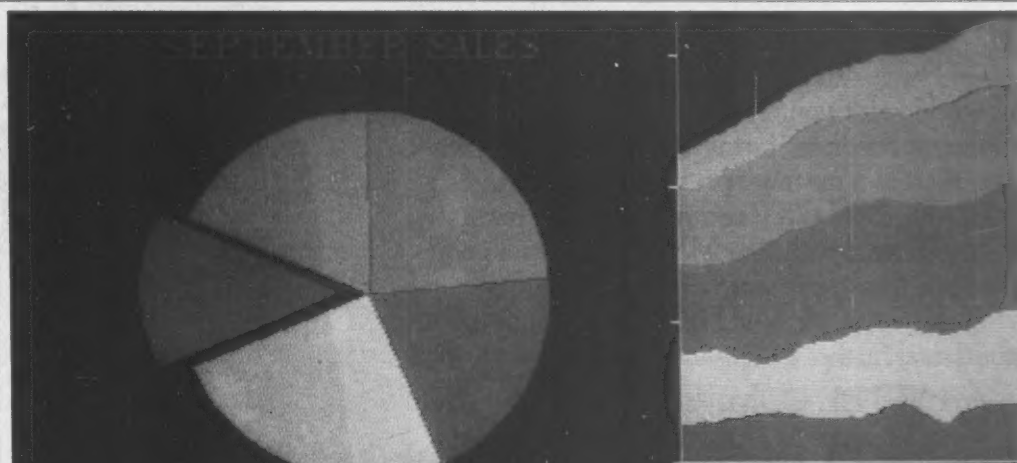
Marketing Arrangement

Datastream's network access communications systems are now being market-

ed by both Carterfone of Dallas and Anderson Jacobson, Inc. of San Jose, Calif., as well as Datastream's own distribution systems.

When the Ascii terminals are interfaced with the T-7CM, the terminals appear to the host computer as IBM 3271 coaxial cable-attached 3277 display stations. They have the full-screen operat-

ing characteristics of a true 3277. The Ascii terminals may be locally attached to the T-7CM, connected by leased wires or dialed in over the public switch network to the T-7CM, which in turn communicates with the host computers by way of a leased half-duplex binary synchronous communications data link (3271-2).



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unit, your only cost would be transportation charges to and from Norcross, Georgia.

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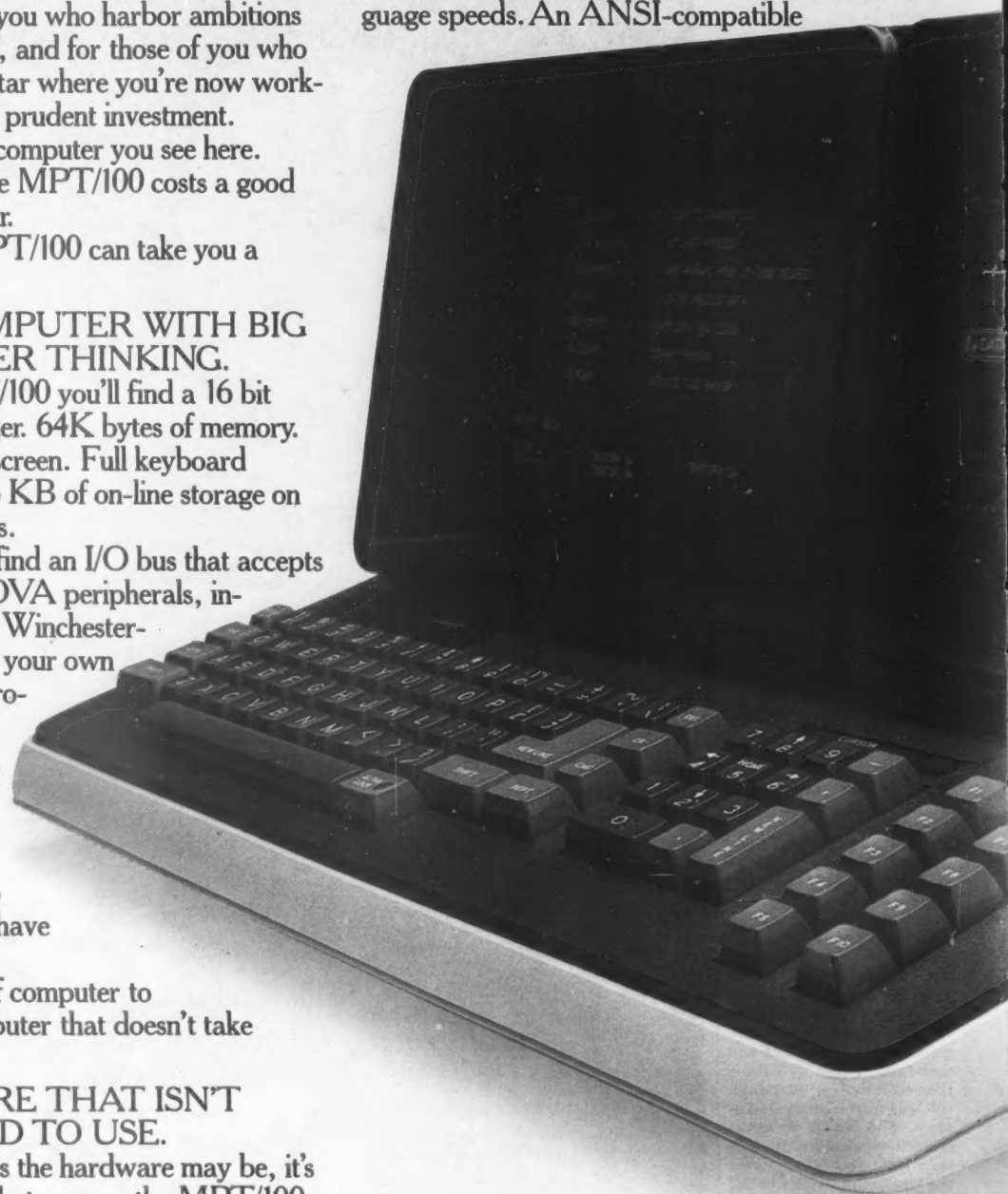
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MPT/100 computers are available for delivery from SCHWEBER, HALL-MARK, KIERULFF, ALMAC-STROUM and R.A.E. in Canada.

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Calendar

Dec. 9-11, Raleigh, N.C. — **Screen Design.** Contact: Q.E.D. Information Sciences, Inc., Q.E.D. Plaza, P.O. Box 181, Wellesley, Mass. 02181.

Dec. 9-11, Caracas, Venezuela — **Acquisition and Configuration Management of Software Programs.** Contact: Director, Continuing Engineering Education, George Washington University, Washington, D.C. 20052.

Dec. 9-11, New York — **Fundamentals of Data Processing for the Non-Data Processing Executive.** Contact: The University of Chicago, Center for Continuing Education, MC Seminar Division, 1307 E. 60th St., Chicago, Ill. 60637.

Dec. 9-11, New York — **Implementing Computer-Based Human Resource Systems.** Contact: The University of Chicago, Center for Continuing Education, MC Seminar Division, 1307 E. 60th St., Chicago, Ill. 60637.

Dec. 9-11 New York — **Distributed Systems: Effective Approaches and Applications.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 9-11, San Francisco — **Basic: An Introduction to Computer Programming for Managers.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 9-11, Orlando, Fla. — **D.C. — Structured Testing.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 9-11, Denver — **Systems Analysis and Design: Concepts and Effective Practice.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 9-11, San Diego — **Effective Computer Operations Management.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 9-11, Orlando, Fla. — **How to Build and Use a Data and Information Resource Directory.** Contact: Arnold Barnett, Barnett Data Systems, 19 Orchard Way N., Rockville, Md. 20854.

Dec. 10, Santa Clara, Calif. — **Ada.** Contact: Beverly Vidler or John Doyle, Soft-Tech, Inc., 460 Totten Pond Road, Waltham, Mass. 02154.

Dec. 10, Los Angeles — **Practical Project Management.** Contact: Augur Data Planning, Inc., 1401 W. Broadway, P.O. Box 34185, Vancouver, B.C. V6J 4N1.

Dec. 10-11, Chicago — **Structured Documentation.**

Contact: Carnegie Press, Center for Documentation Resources, 100 Kings Road, Madison, N.J. 07940.

Dec. 10-11, Raleigh, N.C. — **Effective Presentations.** Contact: Priscilla Goudreault, Q.E.D. Information Sciences, Inc., P.O. Box 181, Q.E.D. Plaza, Wellesley, Mass. 02181.

Dec. 10-11, Boston — **Software Configuration Management.** Contact: Data Pro-

cessing Management Association, Education Foundation, P.O. Box 91295, Department of Software Configuration Management, Los Angeles, Calif. 90009.

Dec. 10-11, Boston — **User Documentation.** Contact: The American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, N.J. 07940.

Dec. 10-11, Waltham, Mass. — **How to Audit and Con-**

trol Computer Systems. Contact: New Hampshire College Resource Center, New Hampshire College, 2500 N. River Road, Manchester, N.H. 03104.

Dec. 10-11, Chicago — **Seminar IV: Local Networks and Office Automation.** Contact: Telestrategies, Inc., Suite 102, 6842 Elm St., McLean, Va. 22101.

Dec. 10-11, Boston — **Software Project Management.**

Contact: Digital Equipment Corp., Educational Services, Seminar Programs, 12 Crosby Drive, BU/E58, Bedford, Mass. 01730.

Dec. 11, San Francisco — **Software Decision Symposiums.** Contact: Vaughan Merlyn, Merlyn Corp., 6075 Roswell Road, Atlanta, Ga. 30328.

Dec. 14, San Francisco — **Accessing and Utilizing Public Data Bases.** Contact:

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Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-15, New York — **Data Communications: Advanced Concepts and Systems.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-15, Boston — **Data Communications Magazine.** Contact: McGraw-Hill Con-

ference Center, Room 3677, 1221 Ave. of the Americas, New York, N.Y. 10020.

Dec. 14-16, San Francisco — **The New Generation in Manufacturing Systems.** Contact: National Institute for Management Research, P.O. Box 3727, Santa Monica, Calif. 90403.

Dec. 14-16, San Francisco — **Data Base Management Systems: A Comparative Analysis.** Contact: Seminar Depart-

ment, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Chicago — **Planning for Office Automation: Concepts and Practices.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Chicago — **Introduction to Micro/Personal Computers: Application, Selection and Usage**

Guidelines. Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Washington, D.C. — **Evaluating and Selecting Computer Software Packages.** Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Washington, D.C. — **Data Communica-**

tions: An Introduction to Concepts and Systems. Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held Dec. 14-16 in Los Angeles.

Dec. 14-16, Washington, D.C. — **DP Project Management: A Practical Approach.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Washington, D.C. — **Word Processing: Effective Operations Management.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Los Angeles — **Introduction to Word Processing: Concepts, Systems and Applications.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Denver — **Integration of Word Processing and DP Systems.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Houston — **Data Base Management Systems: Concepts and Guidelines.** Contact: Seminar Department, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

Dec. 14-16, Richmond, Va. — **Data Analysis.** Contact: Priscilla Goudreault, Q.E.D. Information Sciences, Inc., P.O. Box 181, Q.E.D. Plaza, Wellesley, Mass. 02181.

Dec. 14-16, Teaneck, N.J. — **Data Communications Fundamentals.** Contact: Priscilla Goudreault, Q.E.D. Information Sciences, Inc., P.O. Box 181, Q.E.D. Plaza, Wellesley, Mass. 02181.

Dec. 14-16, Boston — **Developing Automated Human Resource Management Systems.** Contact: American Management Associations, 135 W. 50th St., New York, N.Y. 10020.

Dec. 14-16, Hollywood, Fla. — **International Foundation of Employee Benefit Plans' 1981 DP Institute.** Contact: International Foundation of Employee Benefit Plans, P.O. Box 69, Brookfield, Wis. 53005.

Dec. 14-16, New York — **Data Communications Fundamentals.** Contact: Dorothy McCarthy, Education Coordinator, Q.E.D. Information Sciences, Inc., Q.E.D. Plaza, P.O. Box 181, Wellesley, Mass. 02181.

Dec. 14-18, San Francisco — **The Information Engineering Revolution.** Contact: Jill Hyman, Information Methods (USA) Corp., 504 Totten Pond Road, Waltham, Mass. 02154.

INTRODUCING A SOFTWARE SYSTEM DESIGNED BY AUDITORS FOR AUDITORS.



Computers No Bull for Cattle Association

ST. JOSEPH, Mo. — When it comes to raising cattle, today's ranchers are more apt to be spotted reading a computer printout than riding the range.

The American Angus Association here, established in 1883, operates the world's largest beef breeding registry. Today it keeps track of more than 35,000 Angus ranchers and maintains records on about 10 million

cattle.

It takes more than branding iron technology to keep the cattle pedigrees organized, and that was why the firm automated its registry nearly 20 years ago.

Since automating in 1962, the association has upgraded its system three times. The organization uses its system to store registrations of the purebred black cattle and to issue pedigree certificates to

ranchers along with ancestral information that dates back to the Angus breed's original Scottish ancestors.

Performance Evaluation

In addition to registrations, the system helps breeders evaluate the performance of their cattle. The association operates an Angus herd improvement records (Ahir) program, which aids ranchers in assessing the current

and potential value of each cow, bull and calf in a herd.

The association sends each rancher a listing of each dam in his cow herd. The rancher in turn reports identification and birth weight for newborn calves and reports on the calves' weight at weaning and then again as a yearling.

The computer then calculates necessary age and weight adjustments to fur-

nish an accurate ratio of the productive ability of calves and of the reproductivity of their dams and sires. These adjusted weights measure each animal's growth ability, its mother's fertility and milking ability and its father's ability to sire healthy, profitable cattle.

The breeder uses the output statistics to help determine which calves are likely to be the most productive and which sires and dams tend to produce the best calves. These printouts help the rancher to determine which animals to select for breeding and which to cull.

Since automating, the association has been using Honeywell, Inc. systems for these chores. It started off with a Model 400 in 1962, replaced that system with a Model 1250 in 1970 and in 1979 upgraded to a Level 64/DPS 320 system.

Although the organization received its latest upgrade two years ago, its 12-person DP staff has just finished the conversion of its files from the old system to the Level 64. William Snead, director of data processing, reported. Until now it has been using the Level 64, but has been emulating the 1250.

While there was still capacity left on the 1250, the organization decided to upgrade its system because the communications package on the 1250 was not very good, Snead reported. Moreover, it wanted on-line inquiry and updating capability.

In deciding on the upgrade, the association also considered going over to a data base file structure, but the conversion of sequential file structure to a data base file structure was considered too complicated. Instead it converted the sequential files to index files.

Moreover, a data base file system would have required more disk capacity than the organization wished to acquire at the time. However, the file structure as now established would be easy to convert to a data base format when the organization is ready to commit the resources, Snead noted.

The Level 64 is configured with 768K bytes of main memory, six 200M-byte disk drives, two 9-track tape drives, a 900 line/min printer, a 200 char./min card reader and 14 Honeywell display terminals.

In addition to handling cattle registration records and Ahir documents, the association also uses the system for maintaining membership files, financial records and mailing lists for its *Angus Journal* magazine.

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Introducing the new EXCEL 42, the first fully-featured smart terminal at a bargain price.

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The EXCEL 42 is also smartly designed. Its non-glare screen tilts for easy viewing. Its detachable typewriter-style keyboard with separate cursor control/numeric pad guarantees ease of use while minimizing operator training. Its attractive cabinetry will compliment any office decor and a 14-inch screen is optional.

For maximum reliability, the EXCEL 42 features self-diagnostics, "works in a drawer" logic boards, and a national field maintenance program.

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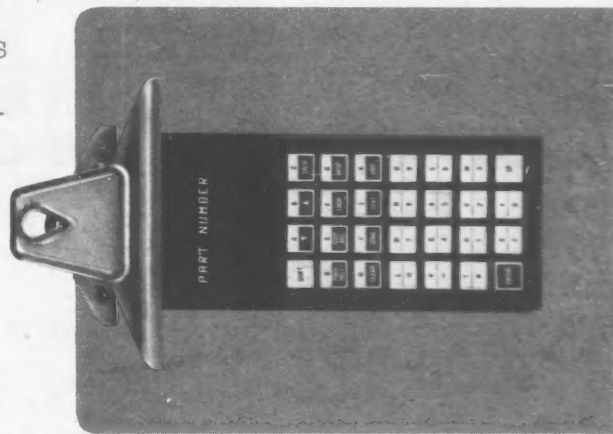
The MSI HandHeld Computers are portable, battery-powered data-entry computers that are the sworn enemy of paperwork. They actually extend the power of your central computer by allowing data to be keyed in right at the point of action. So you can increase productivity by eliminating the traditional bottleneck of handwritten, information-gathering paperwork, which must be delivered to a central location, transcribed, and then keyed into a computer.

The low-cost MSI HandHeld Computers mean good-bye to scratchpads, forms, and clipboards. At the end of the day, the unit simply plugs into a telephone, and all the stored data is automatically transferred over the phone to your central mainframe computer. Which means vital information can be processed and disseminated for management action in a matter of hours instead of days.

Our family of programmable computers can be used anywhere there's information to be gathered. They help people become more productive, and information turnaround is significantly accelerated. Which adds up to bottom-line cost savings.

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Special to CW

CHICAGO — Minicomputers and their 32-bit superminicomputer cousins do not reign solely in the business jungle. They are also important facets in such areas as process control and factory automation.

At the Verson Allsteel Press Co. here, for instance, a General Automation, Inc. (GA) minicomputer is at the center of a half-million dollar investment in factory automation. The manufacturing system, which operates on the real-time high-speed minicomputer, thus far has achieved a number of improvements in lead time and productivity during flame cutting of steel parts from huge sections of steel plate.

In addition to the minicomputer, the steel cutting system consists of a flame cutter, part programming software and computer graphics software and hardware for art program verification and automatic nesting of multiple parts on steel plates.

Verson manufactures some of the world's largest metalworking presses. Each year, up to 15,000 parts are flame cut from 1/4-in. to 12 1/2-in.-thick steel plates. These parts range from a few inches to several feet in any dimension.

Before installing the computer system, the press builder used four manually controlled tracer machines. During peak manufacturing periods, the manually run machines could not cut parts quickly enough to keep up with press assembly schedules. Lead time between release of engineering drawings and flame cutting of the parts often required several weeks.

Without a preplanned plate layout, there was no way to nest each part on the plate for optimum use of the material. Thus, there was relatively little control over the amount of scrap produced when a plate was fully utilized.

Today all this has changed. Since installation of the computer system, lead time has been reduced to a single week. Scrap has been reduced by about 25%.

All Parts Programmed

Each week Verson programs and nests about 300 different parts for flame cutting. All parts are computer programmed as soon as they are released on engineering drawings. After a part is programmed, the data is converted to punched card form and read into disk memory. The large disk memory of the GA computer makes it possible to randomly store large numbers of part programs weeks ahead of press assembly dates.

A part program stored on disk can be displayed at the request of the part programmer on the interactive graphics CRT terminal. Using a graphics cursor, the part programmer is able to quickly verify accuracy of the work piece dimensions.

The tape produced by the computer system not only contains the data needed to cut each part, but also contains the nesting data necessary to make a tight fit between each part. For a permanent record, programmed nests are drawn on paper using the electrostatic plotter. A copy

Uniapt Defines Piece Geometry

Special Uniapt software is used to define work piece geometry for flame cutting, of parts that are assembled into Verson Allsteel metalworking presses. More than 1,000 Uniapt-defined macros (pre-programmed shapes) are stored in General Automation, Inc.'s 16/440 minicomputer. These macros represent preprogrammed shapes for nearly every custom part used in Verson presses.

The macro system used by Verson is fairly complex because all presses are custom-designed. For each new part, the part programmer leafs through a library of macros and selects one that best matches the shape of the part on the drawing. He assigns dimensions to the variables of the generalized macro shape and specifies plate thickness, part number and other data.

A typical macro may define a rectangular shape with variables for length, width, fillets, radii or angle cuts. Each variable is infinitely expandable in any direction. Only the basic shape remains the same after the part is programmed.

of the nest drawing is sent to the production department with the tape so that production staff can see how the torches will travel during flame cutting.

Verson surveyed the minicomputer market thoroughly before selecting the GA-16/440.

Specifically, the GA-16/440 includes a software debugging feature that was not available directly from other minicomputer manufacturers contacted by Verson. Robert A. Amber, manager of the firm's engineering technical services department, commented.

This feature was vital for the software development phase of the application. In fact, the minicomputer and peripherals were installed before the flame cutter in order to write special software for part programming.

Disk storage of the GA computer (80M bytes) was also better than most of the other minicomputers considered, Amber added. Internal memory of 128K bytes was more than adequate and is expandable to 2M bytes.

Finally, the 720-nsec speed of the computer permits the flexibility of using a variety of peripheral devices in the real-time interactive mode without noticeable delays in processing, he claimed. Interactive peripherals currently in use include a GA CRT terminal designed to operate the overall computer system, a Tektronix, Inc. graphics CRT terminal, a Hazeltine Corp. CRT terminal to assist use of the graphics CRT terminal and a Hewlett-Packard Co. CRT terminal for working independently in the foreground partition of the computer.

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Cuts Program Development Time Audit Package Switch Keeps Marine Corp. Afloat

By Rita Shoor

CW Staff

MILWAUKEE — When Marine Corp. DP auditors here switched from Turnkey Systems International's (TSI) Audit Analyzer to Auditec from Carlton Corp., they were shooting for some very specific goals.

"We wanted to cut program development time by 25% on complex applications," John Seaman recalled. Seaman, then DP audit manager in charge of the project for the bank holding company, also wanted to cut the education time for new users by 25%. And he wanted to decrease the audit package execution time in the firm's IBM 370/158 OS/MVS environment, if possible.

Addressing program development first, he assigned an audit project to one of the auditors who had worked with Turnkey's package on other assignments for about six months. The project involved multiple record types, generated at least six reports and was considered

to be complex by the Marine staff. After some 80 man-hours of effort, the project was still unfinished, Seaman said. The same auditor was able to complete the identical task in 60 hours when Auditec was installed.

After achieving his first objective — reducing program development time by 25% — Seaman took a serious look at

the time required to enable an auditor with little or no practical DP experience to effectively utilize Auditec.

The auditors' educational needs amounted to attending a three-day training session and devoting about a week to reading the Auditec manual and writing a "few simple reports," Seaman maintained. One auditor, a com-

puter science major, never even attended the Auditec class, he noted. Yet, he was able to generate a "very complex program" after simply reading the vendor's manual. "I don't think he could have done that with TSI's product," he said.

Seaman was happy enough with the product to eventually join the Carlton organiza-

tion. But Mark Pettersen, who took over Seaman's responsibilities at Marine in September, also seems satisfied with Auditec. "Carlton's product support was outstanding" when the software was being installed, he said, noting that the vendor had routinely offered a maximum response time of 24 hours when problems arose.

Report to Cover Regulatory, Legal DP Issues

LOS ANGELES, Calif. — A monthly publication dealing with the legal and regulatory issues of the computer and telecommunications industries has been launched by Law & Technology Press.

The Scott Report, written by Michael D. Scott, editor-in-chief of *The Computer/Law Journal* and executive director of the Center for Computer/Law, is a 16-page monthly research report on issues ranging from computer litigation to government legislation.

Topics covered by the newsletter will include computer software protection, pending federal computer crime legislation, electronics piracy, the legal problems caused by the shortage of satellite transponders and the impact of new tax laws on high-technology industries, a spokesman said.

Subscriptions to the report are \$147 per year or \$168 outside North America.

However, prepaid orders received before Dec. 15 entitle subscribers to three additional issues at no extra charge and a copy of *The Computer Law Reading List*, also offered by the publisher, according to the spokesman.

Sample copies of *The Scott Report* are available from Law & Technology Press, 3500 S. Figueroa St., Suite 211, Los Angeles, Calif. 90007.

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Mining Firm Dumps Traditional DP for DBMS

CLEVELAND — After 32 years of conventional DP, the Hanna Mining Co. here is converting to a data base system.

When the punch card system was replaced by IBM 360 computers 15 years ago, the intention was to install a data base "at some future time," a spokesman recalled. Today, data base systems are being built and used successfully in ever-expanding areas.

Reportedly one of the world's largest iron ore producers, Hanna produces nonferrous minerals and metals and has growing interests in energy-related activities. It has operations and interests in Canada, Guatemala, Brazil and Colombia. Its 1980 earnings topped \$38 million.

Hanna established three IBM 360 data centers in the U.S., each designed to oper-

ate independently in order to serve the needs of its particular area. Although the equipment has been upgraded since then, decentralized processing has been found to be the best method of operation in order to provide control over the diversity of products.

The corporate office applications in Cleveland are the normal payroll and payables, sales and cash flow analysis

and distribution of costs to joint-venture participants, the spokesman said.

Applications at centers located close to the mining sites include payrolls for hourly employees, accounts payable and inventory control and operating equipment maintenance.

"When the 360s were installed, IBM was the only vendor that would provide adequate support to our re-

mote locations," Hanna's Cleveland systems manager, Ed Banks, said.

To fill the growing demands for more responsive and timely information, it was decided to first replace the hardware and operating system and then search for a data base management system (DBMS). The equipment selected was an IBM 4331 running under DOS/VSE.

The DBMS selection criteria included a facility for unassisted ad hoc inquiry by users; interactive design; an easy-to-use report preparation method; ease of modification, including automatic reorganization of indexes; recovery capabilities; minimal staffing requirements; adequate vendor support; and availability of future enhancements.

Three Choices

A consulting firm narrowed the DBMS choice to three: IBM's DL/1, Cincom Systems, Inc.'s Total and Cul-lane Data Systems, Inc.'s IDMS. However, there was still a feeling that more user-friendly systems could be found. After evaluation by Jim Mann, Hanna's data base manager, of two more DBMS — Software AG's Adabas and Intel Corp.'s System 2000/VSE — the final decision was to go with the Intel product.

"We want the users — people ranging from computer clerical workers to competent programmers — to do 80% of the programming," he explained. The interactive reporting capability was demonstrated to Hanna's operating management by loading a current personnel file into a sample data base and allowing them to test the system. This was followed by seminars and demonstrations to the end users.

The entire DBMS selection process took about seven months. System 2000/VSE was installed in three days with another three to load the sample data. An Intel instructor conducted a two-day course for the payroll and benefit administrators and the systems staff.

At the end of the first day, non-DP personnel were able to secure responses to their questions from the prototype data base via the Quest language. By the end of the second day, they were asking complex questions and updating resident information.

The first DBMS application combined the payroll, benefit and human resource information into a single data base. This was accomplished by the construction of logical bridges, which permit both the DBMS and batch systems to run parallel.

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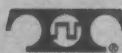
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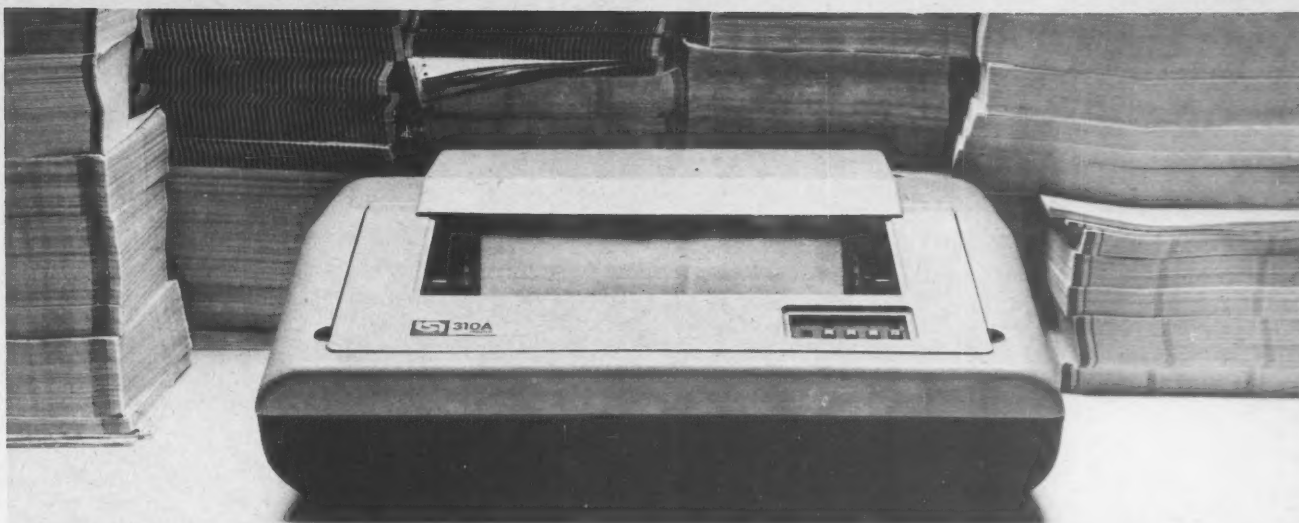
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DEC LA120	180	914	748	65
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Centronics 704	150	582	582	65

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EDITORIAL

A Time for Adjustment

The U.S. Labor Department recently confirmed what many people in the DP industry have long known: Many employment sectors in the U.S. have grown dramatically over the last 30 years not despite but *because* of computerization.

In fact, those sectors that have seen the greatest automation of people-intensive operations — including service industries, finance, insurance and government — are the very ones that have grown the most since 1950, according to the department's Bureau of Labor Statistics (BLS). And that trend will continue for the foreseeable future, BLS said [CW, Nov. 2].

This news comes at a particularly felicitous time because these same employment sectors are entering a second phase of automation. Machines are migrating from the computer room into the office.

However, millions of office workers are experiencing the same anxiety and anger as they await automation that many of their counterparts felt 20 and 30 years ago when computers were first introduced into their organizations to help with statistical work or financial administration. Now, as then, there are those whose jobs will be fundamentally changed; their resentment will be great.

As one highly experienced, skilled and educated office worker recently lamented, "Now any moron will be able to do the job it has taken me years to get so good at. They won't need me anymore."

That need not be the case. If organizations take the time and trouble to respect their employees' feelings and desires, office automation — any automation, in fact — can be eased in with minimal disruption.

But make no mistake — there will still be disruption. Even the broad-brush, upbeat BLS survey conceded that computerization has caused some "painful" employment adjustments. How much adjustment is not clear. No one — not the government, not labor unions and certainly not the DP industry — has ever gotten a good handle on the true extent of the job losses directly attributable to automation.

For the DP industry itself, the exact numbers are not all that relevant. We know there will be some organizational disruption in almost every instance of automation. Fortunately, BLS noted, there are ways to ameliorate the pain, and hopefully we will learn to use them.

Today's DP management is the instrument of changes as great as those of the industrial revolution. Studies such as the one from BLS can make information systems directors feel better about those changes. But these statistics also dramatically point out the growing responsibility of our industry to the organizations and the society it serves.

DATA PAST

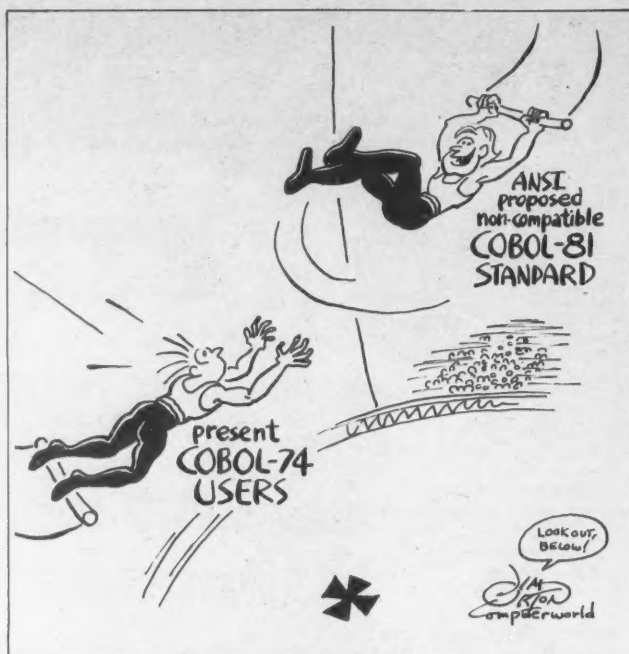
Five Years Ago Nov. 8, 1976

WASHINGTON, D.C. — The Bell System had spent more than \$1 million between April 1 and June 30 in connection with its lobbying effort for the Consumer Communications Reform Act, according to Rep. Tim Wirth (D-Colo.).

DENVER — The Northwestern National Insurance Group of Milwaukee, the Home Insurance Group of New York and the Reliance Insurance Co., also of New York, were among 56 insurance companies indicted in district court here for illegally obtaining individuals' personal records.

Ten Years Ago Nov. 3, 1971

SAN FRANCISCO — The RCA Computer Users Association (CUA) said it would attempt to stall RCA contract certification process until RCA agrees to higher levels of support. Delegates representing more than 25% of RCA's users declared they would recommend to their managements that they refuse to approve a settlement with RCA unless RCA agrees to the support requests made during CUA meetings. Certification is RCA's term for a survey of contractual commitments. CPU recommendations included Release 8 of TSOS and DMS compatibility with OS/70.



'I've Decided to Do It Alone'

LETTERS

Unfair to RCS Vendors

As a professional with five years of sales and marketing experience in the remote computing services (RCS) industry, I am strongly offended by the tenor and content of the article "Pitfalls Seen in Switching RCS Vendors" [CW, Oct. 19].

The writer drew us as unscrupulous rascals — spying, dodging, even erasing source code in a desperate, self-serving attempt to lock in our clients. The article suggested that the client's dilemma is which "tactic" (an adversarial term if ever I heard one) to use to try to manipulate the evil vendor into submission.

This is so unlike my experience that I must question on what basis the writer professes RCS expertise.

Naturally a good representative is "very sensitive to trouble signs." To be any less would be to deny the client the prompt, personal service he deserves. And to imply that cost-cutting suggestions appear only upon a threat to convert is ludicrous.

The RCS industry has constantly sought pricing policies and new products that offer substantial value added in both reduced cost and better service. Port pricing and other mass resource contracts, dedicated systems and, most recently, on-site minicomputers with network and host access are only a few examples. A professional rep constantly monitors usage patterns not to spot a future conversion attempt, but to ensure that the client is operating under the best pricing plan for his current needs.

Finally, should a client decide it is in his best interests to convert, why then, any rep worth his salt would and does provide the same support in the conversion effort as has been provided all along.

Ann Arbor, Mich.

Carol Shulman

How TRS-80 Stacks Up

A comparison chart in the Sept. 28 issue, Page 55, contained some glaring inaccuracies. The chart was first run with the IBM personal computer announcement. Credit for the chart was given to Control Data Corp., IBM and the Yankee Group.

The Radio Shack TRS-80 Model II has a minimum configuration of 32K (not 4K), with one 8-in. diskette (not cassette) and a minimum configuration price of \$3,450 (not \$399). A "standard" configuration would be about \$6,248 (not \$4,727).

In addition, the description of the TRS-80 Model III minimum configuration was also incorrect. It is 4K (not 48K) and cassette (not two diskettes). In the standard configuration described, it would sell for \$3,333 (not \$3,972).

Jon Shirley
Vice-President, Merchandising
Computer Products

Radio Shack
Fort Worth, Texas

Cartesian Logic

I have been enjoying the "History of Computing" series.

In reference to Alan Turing's mid-1940s essay "Can a Machine Think?" ["History of Computing," CW, Oct. 5], I have come to think of a new question that future decades may similarly debate. Consider that day when "the Descartes" amongst artificial intelligence-programmed computers startles some unsuspecting terminal operator by pronouncing "Computo, ergo sum."

Question: Is there as much Cartesian logic for positing existence from "computing" as from "thinking?"

Larry Heffel
Chief, Financial ADP Systems
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GETTING AHEAD IN DP / Donald J. Berardo

Sinking in a Swamp? Don't Relegate, Delegate

If you are up to your neck in alligators, there may be people right on the edge of the swamp who can save you.

Many people who feel they are overworked often never look up from their tasks to analyze their situation and find a solution. They feel their situation is helpless and that their only alternatives are to put in extra hours without complaining or look for another job. But there are usually an abundance of "natural resources" that can be tapped to solve work-flow problems.

Tap Your Company's Resources

If you are a manager, you have a staff who looks up to you for assignments and direction. The ability to delegate responsibility to them is one of your most important skills. But even if you don't officially have a staff reporting to you, there are often people around who would like to pick up extra assignments that would make their jobs more interesting or give them some valuable experience or visibility. Ask around. If you approach people in the right way and can sell them on the benefits of doing a certain assignment, you're sure to find a "taker."

Too many people feel they have to "do it all themselves" in order to ensure that the job is done right. They feel this way because they've always handled certain jobs in the past and believe no one else can do them or suspect that someone else won't have

standards as high as theirs.

The fact is that someone did get the job done before these people arrived on the scene and someone else can do it now. Besides, the advantage of delegating work is that you don't lose control of the assignment's quality — you simply make sure that someone else measures up to the standards you have established. "Well," certain people will object, "that may be true, but I'm so busy I

Computerworld this week begins a new column, "Getting Ahead in DP," which was conceived to improve those nontechnical skills necessary for advancement in the business world. The column will appear in these pages once a month.

don't even have time to explain it fully. I can do the job myself faster."

This is short-sighted. Such people need to consider the long-term; if they invest the time now to train someone how to do a task, it will pay timely dividends every day from then on. For instance, let's say it takes you six hours every month to debug a certain program and it would take you fifteen hours to train someone to do the job. In just a few months you will gain back the time invested in the training and have six more hours each month to devote to other projects.

It's crucial, of course, to train the person thoroughly and patiently. If you hurry through your explanation, the person may gum up the works so

badly that you must spend double the normal time to set things right again. Remember: for every hour you spend training someone else, you eventually will save many more.

When you have delegated an assignment, however, your responsibility doesn't end — it simply changes into a different sort. Ultimately, you will have to answer for the results.

Don't wait until the project is com-

ing smoothly and according to instructions. You might ask the person to report on his progress once each week or whenever a key aspect has been completed. Such a procedure will make both you and the person doing the assignment feel more comfortable.

Once you have delegated an assignment, however, don't stand over the person's shoulder and tell them exactly how to proceed with each step. First of all, the person may have accepted the job in order to develop themselves and that won't be possible with you hovering over them like a guardian angel.

Room to Move

Give the person some air to breathe and some space to try their wings. Tell them what to do, not how to do it, and you will be amazed at their ingenuity. The person may not be comfortable with the process you have always used and may discover another that is just as effective or even more so. This will give them satisfaction and make them appreciate your willingness to let them find their own way. It will also make them more receptive next time you are overloaded and approach them with some work you hope to delegate.

Berardo is a management counselor and career therapist. He is a vice-president with the Meld Group in Newington, Conn., publishers of a monthly newsletter on management development.

READER COMMENTARY / Charles Verbisky

Learn to Communicate in English and Basic

The premium placed by the business and scientific communities on the ability to communicate with computers, in any one of a growing number of programming languages, has turned these institutions into arenas of linguistics. Yet at the same time, the worst seats in the house have been relegated to the English language.

Academia has responded to the need for these professionals with courses, curriculums and institutions dedicated to effective communication with machinery. In a relatively short time, their students become proficient in any number of computer languages.

Age Not a Factor

Age is not a factor in this new linguistics. At "kiddie programming school," youngsters learn the Basic computer programming language in a "summer camp" atmosphere. Here, a 12-year-old can proudly display his latest microprocessor-driven, graphically displayed stock market analysis program.

In the data processing center, however, the competence of the multilingual professionals produced in these technological environments evaporates when using the English language. Programming syntax errors — computer spelling and grammar

— are unforgivable sins, while English syntax and grammar errors are glossed over as being of secondary importance.

Yet both disciplines demand the same skills. The design and coding of a computer program requires both a mastery of the "reserved words" or vocabulary of the given computer language, as well as enough concentration to choose from this vocabulary words that will produce the desired results.

These same skills are discarded when English is used to describe or offer instruction regarding the newly developed program or system. The ongoing process of rewriting computer programs continues for weeks, months or even years after the initial coding. However, rewrites of memos, documentation or instructional material regarding the same programs or systems are rare.

In the Cobol language, the machinery demands correct paragraph structure. Each general "division" of a program must be broken down into subdivisions or "sections." Paragraphs in the "procedure division" must be written with logical flow and order. Notwithstanding this background of paragraph structure and order, any mention of paragraph structure in English receives only a rolling of the eyes from these same

technicians.

One rule of the Cobol language requires that each sentence must end with a period. Failure to follow this rule results either in code the computer considers unacceptable or a program that produces totally unpredictable results.

The same rule of the English language, it is believed, can be safely ignored. It comes as some surprise that penmanship in English does not totally consist of capital letters as does computer coding, or that the English word "through" is not spelled "THRU" as in Cobol.

While the graduates of our "summer camps" and data processing schools can produce increasingly complex computer code, many cannot explain, in person-to-person communication, how their new programmed wonder works or how it is used. Data processing instructors must begin to impress on their students the fact that even if they can solve the most complex business or scientific problem on their home microcomputers, they are useless — even worse than useless — in the business or scientific communities unless they can communicate their knowledge and document the functions of their programs and systems in comprehensible English.

Human communication cannot be

relegated to a status level somewhere beneath Cobol or Basic even in a data processing environment. Major business systems have failed to function because their users have been unable to comprehend the instructions given them by the programmers and analysts. Programs or systems designed six months ago cannot be understood or modified because the documentation or explanatory material (where it exists at all) is incomprehensible.

These problems are not solved by sending children to "kiddie programming school," but by sending them, if necessary, to summer school. While one Cobol reference manual lists some 329 "reserved words" — the extent of the vocabulary for this particular version — a quick glance at a dictionary reveals thousands of English words. Our language requires mastery of at least a significant percentage of these words.

To master the English language demands a more stringent effort not only on the part of educators, but students as well. Our language remains the primary communicative tool. Computer languages should make us at least bilingual, not blind to the requirements of person-to-person communication.

Verbisky is a technical writer with three years of experience in the data processing field.

Humorous Side to Shortage

We appreciate your humorous article "The Programmer Shortage Is an Illusion" [CW, Oct. 5], which utilized various quotes and thoughts of Ethan Bortman, a manager at Rand Information Systems, Inc. (RIS).

Either Bortman is living like an ostrich with his head in the sand or he has just not kept abreast of the many articles published in trade journals, various periodicals and newspapers written by his peers that conclude that the number of qualified personnel has not kept pace with the acceleration of technology.

Also, it appears he is not aware that grade schools, high schools, colleges and technical schools, on the advice of DP departments in the U.S., have all expanded curriculums to satisfy the swelling need for computer people both now and in the future.

Of course we are sure Bortman is cognizant of one thing, that he hired 25 people this year and that they did come from somewhere else. However, does he realize that if they were not trainees, some company in some city may be facing a shortage of people, a shortage Bortman created?

Bortman's only real idea on hiring computer personnel is to seek out people for employment from depressed areas of the U.S. and/or the world. This seems to work for RIS, but how many DP managers really travel enough to accomplish this task? Our guess would be very few in relationship to the number of managers in the data processing field.

For Bortman to be brass enough to

state that recruiters "contribute nothing to society" is as much a misstatement as saying Rand Information Systems, a \$20 million software company, is about to overtake IBM.

We can well imagine what kind of conversation may be taking place in London after Bortman or one of his cronies has made a juicy recruiting raid in merry old England: "I say old chap, I thought those bloody headhunters were creating a false shortage of programmers here, but I understand those blokes from RIS have just passed through town."

Rollie Martin

Assistant General Manager

Cemco Systems
Oak Brook, Ill.

LETTERS

Headhunters Don't 'Steal'

In "Designer Shortfall to Plague '80s" [CW, Oct. 12], James R. Porter, vice-president of Informatics, Inc., is quoted as having said, "The headhunter who brought you a programmer this year will steal him back next year."

As vice-president of Douglas Personnel Associates, Inc., a data processing placement and search firm, I take exception to Porter's statement. Ethical search firms or headhunters do not steal programmers back once they have placed them with a company. Self-preservation dictates that intelligent recruiters do not jeopardize a client's business by such underhanded behavior.

Perhaps Porter's programmers, once on-board, are not happy and are calling their search firms saying "get me out of here!"

I therefore suggest that Porter scrutinize his internal environment. Perhaps Informatics does not pay enough attention to the professional growth or remuneration of their programmers or has not learned the science of employee retention.

A headhunter's function is to service corporate clients. Headhunters do not create the conditions that make it difficult for Informatics to keep its programming staff.

I also suggest that Porter review his company's relationships with their recruiting sources — there is obviously room for improvement there as well.

Tobey Klein

Vice-President

Douglas Associates, Inc.
Oradell, N.J.

Shortage an Illusion

I am a regular reader of *Computerworld*. In many issues I have read articles about the shortage of programmers. Some articles mention a 37% shortage. "Designer Shortfall to Plague '80s" [CW, Oct. 12] mentions it to be 20%. Anyway, there is a shortage.

I think this is all an illusion. My classmates and I graduated in June of '81 and out of 53 graduates, only one got an entry-level job as an applications programmer. The rest of us are sending 20-30 applications every week, but because of advertisements like: "Must have 2+ years experience, must know Cobol, Fortran, PL/I, DOS, OS VS Assembler, JCL, Pascal, Basic, Roscoe, Mark IV, Ada..." and so on, it is difficult to get even an entry-level job.

In the same article, Porter said the search companies are getting richer and making more money than us.

Why don't the companies who need programmers advertise, invite applications, employ fresh new talent and train them instead of feeding parasitic search companies and employment agencies.

Next time you write an article about the shortage of programmers, make sure that you print a list of 100-200 companies that are really in need of programmers. Ask them not to advertise just to show they are "equal opportunity employers."

We are all ready to accept low pay and help reduce this shortage.

Vivekanand Joshi
Staten Island, N.Y.

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Bortman Right

Nothing has sent me scrambling for a back issue of *Computerworld* quite as fast as the Letters to the Editor [CW, Oct. 19]. However, on re-reading the Ethan Bortman comments I found that they still reflect my own experience, having had hiring responsibility for more than half of my dozen years in computing. Perhaps this guidance is in order.

To those who missed the poetic subtlety of Bortman's remark, it can be more explicitly restated: "There is no programmer shortage for the astute manager."

To recruiters generally: Don't try to fight a pro like Bortman with marketing hype. He knows his personnel needs and can fill those needs more effectively and economically without you.

To Bortman: Next time go after the other half of the diaphanous duo, not the one on crutches, but the one trying random combinations of letters in an attempt to spell Shazam — the ubiquitous mismanager. He uses the shortage as an excuse for poor performance and uses the agency as a well-reimbursed whipping boy for personnel problems that are primarily the result of his own incompetence.

To senior management: Check the hiring costs for computing personnel in your organization. If fees are paid on a significant proportion of new hires, you may suspect that you have a mismanager who is out of touch with the market.

To hiring managers: Remember that you will have to underpay an employee that is steered to you by a recruiter by most of the amount of the fee for the transaction to make financial sense, but what about the future cost of that underpayment?

Judson D. Human, CDP
Computer Systems Manager
West Hills College
Coalinga, Calif.

Shortage Silly

I would like to comment on the article "The Programmer Shortage Is an Illusion."

First, there have been numerous articles in *Computerworld* verifying the shortage of technicians in the field of data processing.

The United States Department of Labor has stated that a significant deficiency is expected well into the 21st century.

It is just silly to suggest that a headhunter, in appealing "to the prurient interests of programmers" and moving someone from a position in company A to a position in company B, is creating an additional open position: The net number of empty posi-

tions is still one!

Bortman has, as have so many companies, had to find alternatives to recruiting staff for his company's development of 12 new systems, but that is a separate issue from whether or not there are people to recruit. In his case, he, instead of a headhunter, has gone on a "hiring push" and hired people away from other jobs. He did

not "sit back and wait for calls from job seekers" as he suggests headhunters should do.

I look forward to reading my issue of *Computerworld* each week and I hope good writing standards will be maintained.

Linda Adamson
Director

Personnel Sciences, Inc.
New York, N.Y.

LETTERS

Offensive Cartoon

After reading Jim Orton's humorous cartoon on the editorial page [CW, Oct. 26], I must stop and reflect on why you have such a bigoted attitude toward headhunters.

Perhaps you feel guilty about accepting money from our firms to advertise in your publication.

Perhaps you are merely

jealous of successful enterprises that provide cost/time effective methods of staff assistance. In this aspect of our business, we find many individuals unable to admit to their inability to recruit.

In any event, I am mystified as to your motives. Recruiters are people, too. Perhaps you could explain to the families of the many recruiters who read *Computerworld* your use of the term "Fli-bi-nite."

John Paver
Assistant Manager
National Recruiters, Inc.
Minneapolis, Minn.

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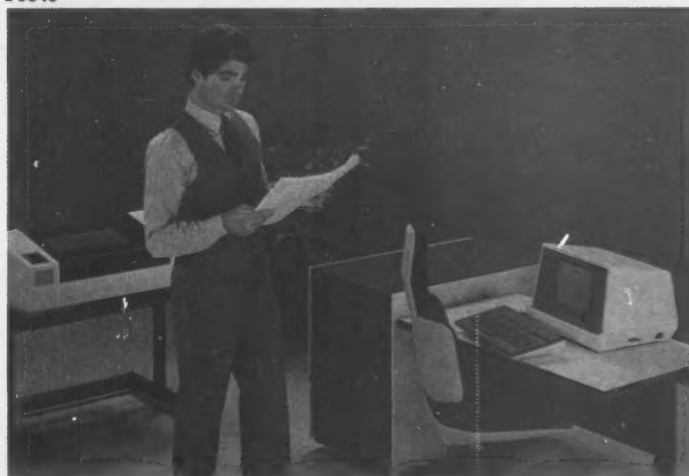
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The I-9010 table-top 8-bit micro-oriented system offers advanced ergonomic design, multi-language support and communications capability. It is easy to operate and understand.



I-9020

Amusing But Disappointing

It amuses but occasionally disappoints me to hear someone like Ethan Bortman of Rand Information Systems, Inc. (RIS) quoted as having said "recruiters create an artificial market" by "dangling attractive job prospects in front of technicians."

That is as realistic as believing a physician is responsible for the problems he uncovers.

Bortman had evidently experienced some attrition with his staff and concluded a headhunter with an attractive "dangle" was the reason. There are many reasons a DP pro will change companies, but hardly ever because he simply knows of the opening. Informing a qualified can-

didate is about all a recruiter does when he calls.

Companies with needs determine if a position exists. Employers, and only employers, determine if a job order is to be filled by a professional recruiter. If there are no positions available there will be no recruiters. Not much artificial about that.

Bortman proudly admits to his own company's growth and increased manpower requirements. Instead of blaming recruiters, he should realize that he is causing other companies to experience his "artificial shortage" when their programmers go to work

for RIS.

Bortman said "Headhunters are like pornography because they appeal to the prurient interests of programmers." I wonder what *Computerworld* and other newspapers could be called when they arrive at homes and offices "flashing" their help wanted sections?

In spite of all the sour grapes, recruiters never force a company to make an offer and never force a candidate to accept.

Very few companies have ever hired an experienced professional who hasn't worked for another com-

pany first. So, headhunters will continue serving their clients and be proud to inform qualified candidates of new opportunities that exist in the free marketplace.

Bill B. Rozner

DP Management Recruiter
Witkay Associates
Concord, Calif.

Pornographic Headhunters

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Based upon the facts presented in the article, my conclusion is that Bortman is the ultimate hypocrite. He is apparently actively practicing himself that which he so wholeheartedly condemns. In addition, his importation of British staff is a denial of his statement that the shortage is an illusion because in order for non-citizens to work for his firm, RIS had to certify to the United States Department of Immigration that they couldn't find people of those skills in the United States.

I am a headhunter. I don't peddle people or companies. I don't misrepresent my clients to the people I contact, nor do I misrepresent the people to the client company. If presenting the truth is "dangling an attractive job prospect..." then I am a dangler. If I am the catalyst for a career switch that is beneficial to both the individual and the client, then I have performed a beneficial service.

If the livelihood of a family unit, the quality of work life and so forth are "prurient" then I am a pornographer and Bortman doesn't hold those programmers who allow him to be a director of his company in very high esteem.

It seems to me that RIS would make a better source than client, don't you think?

Raymond W. Mellott
Executive Resources, Inc.
Fort Wayne, Ind.

Standard Contracts

A recent issue contained an interesting Reader Commentary by James Station entitled "Standard Contracts for Users a Poor Idea" [CW, Oct. 12]. Since our firm was mentioned in an earlier article on user form agreements, I assume that Station may have been referring to International Computer Negotiations, Inc. (ICN) when he spoke of a "consulting firm" participating in the development of such contracts. Because ICN has been involved in creating general procurement agreements and standard form contracts for users for more than seven years, we feel compelled to correct several misconceptions that may be created by Station's commentary.

First, neither ICN (nor, to our knowledge, any other firm) is involved in the development of form agreements that would, could or should be utilized by all users. Developing competent form agreements for a single user is a significant business and legal challenge; developing them for the entire community of computer users would be a waste of time and an insult to the intelligence of users and vendors alike. User form agreements must be tailored to a specific user, to specific types of transactions and to applicable local laws.

Second, tailored to the needs of a specific firm, user form agreements offer users many of the same benefits that vendors obtain from their own standard documents: time savings on repetitive transactions, the ability to draft language prior to the heat of actual negotiations, prereview and preapproval at all relevant levels of staff and management and increased protection resulting from more comprehensive treatment of issues important to the user. But, like vendor form agreements, user forms have limitations.

LETTERS

In particularly complex or unique transactions, the only proper approach may be to draft from scratch. In other deals, the user's form and an addendum may be adequate. The important point is that user form agreements have a place, particularly for larger users with significant acquisition volume. Even where the user forms must be modified, they offer a far better place to start than the vendor's standard contract.

Third, to be effective, user form agreements must be fair and reasonable. As Station admits, there would be little value in preparing user form agreements that purport to cram pro-user provisions down the throats of "unsuspecting" vendors. Neverthe-

less, larger users with high bargaining power can employ form agreements on a "fait accompli" basis, essentially requiring smaller vendors to do business on the user's terms or not at all. Lest this approach be called reversing "the roles of protagonist and antagonist," why should lawyers for large multinational users be required to specifically review (and almost always rewrite) the one-sided form contracts naively submitted by small vendors in \$50,000 transactions? Where they are appropriate, user form contracts can literally save thousands of dollars in every transaction.

Fourth, by advocating the utilization of user form agreements for spe-

cific purposes, ICN is hardly abandoning the idea that users should negotiate vendor agreements.

The problem is that most users have neither the time nor the resources to negotiate every data processing agreement. Of course you can "pick another vendor" if your leading vendor refuses to negotiate on a major procurement. But can you afford to negotiate at all on smaller transactions? Or to waste extra time and money revising blatantly pro-vendor forms on medium-scale deals?

Properly prepared and utilized, user form agreements can be a significant weapon in the user's efforts to bring equality to its side of the bargaining table.

Joseph Auer
President

International Computer
Negotiations, Inc.
Winter Park, Fla.

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HUMAN CONNECTION / Jack Stone

Systems Manager Learns to Deal With 'Kludge'

"Around here, we pack our own parachutes." With this parting message of encouragement (or at least I chose to interpret it as such), my project manager ushered me out the door and on to my next consulting assignment overseas to support new mini installations. This time I was off to South America.

Parachute-wise, I was far from enthusiastic about the journey. One reason: I was escorting a shiny, new version of the operating system (OS). The system's checkout was purportedly completed only a few hours before my departure.

This OS version was crucial to the

Argentine and Chilean sites on my schedule because it included facilities to handle the complete Spanish language character set for all applications. (For some bizarre purpose, the earlier OS version had the special Spanish characters available only for word processing applications.)

Another concern I had was the matter of computer operations management and control at the site. The typical "systems manager" is a person from the administrative side of the house, with some experience with manual data systems but no computer background.

Shortly after receiving the systems

manager job, he takes a month-long DP training course, starting with machine operations management. While it is not reasonable to expect a newcomer in the business to acquire a thorough understanding in such a "crash" program, it is hoped that enough will be learned to form an adequate basis for subsequent on-the-job (self-)training.

I've sometimes wondered how long it would take for such individuals to master or even comprehend systems management and control — an area that represents a totally new dimension of thinking for most nontechnical folks. But I've tried not to concern

myself with the potential mental trauma that the systems manager must endure when the first fatal software error occurs and systems support is half-a-planet away.

About three minutes after I arrived at the Buenos Aires site the systems manager reported an unusual systems condition that had just developed that very day. "There's something clogging up the computer output," he reported. "We can't get anything to print and I've had no training in system programs and allocation."

No 'Drano'

As I didn't bring a can of "drano" in my systems tool kit, I found myself forced into attacking the problem with a lesser capability, namely, my powers of deductive reasoning. I quickly checked "power" and found all units "on" and in "ready" state. Uh-oh, I thought. I'm in real trouble. Power okay — what else could be causing the foul-up? My whole life seemed to quickly pass through my mind's eye.

During the passing montage, I recalled my sixteen-year-old kid, Adam, chiding me about my misuse of my own micro. "Dad, can't you get it straight? Secondary storage is finite in its capacity. F-I-N-I-T-E. Programs that generate work data sets whose storage requirements exceed that available will invariably abort."

Reality returned and I feverishly manipulated terminal controls to check storage utilization in the systems disk. Up came the display: 97 0/0/. There was no way print files could be allocated. After re-establishing my professional veneer, I reported the system to my client who assured me that he had not added files to the disk.

The systems catalog showed that a kludge of system-generated data sets had taken up available work space on the disk. The system was not automatically deleting them at job termination time. I cleaned them out and printout was resumed.

The new OS slipped in gracefully, the briefing to top management was well-received and I left town breathing somewhat more easily. But I wasn't totally relaxed. What would have happened if disk space was exhausted and the expert computer consultant from the U.S. (yours truly) hadn't been around?

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'Those System Software Guys Make Me Nervous.'

BY JACK WORLTON

THE YEAR 1981 MARKS THE 38th anniversary of the founding of the laboratory at Los Alamos, the 35th anniversary of the dedication of the first electronic computer (Eniac) and the 29th anniversary of the founding of the laboratory at Livermore. In the years following these events, there has been a "symbiotic" relationship between science and computing: Science has provided motivation and funding for the development of supercomputers, and supercomputers have provided means of solving problems in science that are otherwise intractable.

In this span of time, the speed of computation has increased from a

few operations per second in the electromechanical computers used at Los Alamos in the war years to more than 10^7 operations per second in current Class VI supercomputers. This change of some seven orders of magnitude in less than four decades is unprecedented in the history of technology. Yet we have an urgent need for an increase of one to two orders of magnitude in computation speed in this decade.

The effects of this projected speedup in computer capability would be to:

- Reduce the time needed to complete computationally dependent Department of Energy (DOE) programs. For example, a problem that now requires 100 hours of CPU time on a Class VI computer requires several weeks of real time to complete, because no single problem can be run to completion in one session, but must be run a few hours per night. A speedup of 100 to 1 would reduce the real time for problem completion from several weeks to just one night.

Further, problems that now require one hour of CPU time on a Class VI computer must be run overnight, but these would be reduced to less than one minute and could be done inter-

actively many times per day. Thus, the programmatic effect of the 100-to-1 reduction in compute time would be to reduce the time to complete a given project and thereby reduce the time to complete a given defense or energy program.

- Increase the quality of the defense and energy products produced by DOE. The products with which DOE is concerned are radically different from ordinary consumer products because they include such things as the safety and security of nuclear weapons and nuclear reactors. The proposed 100-to-1 speedup in computer performance would allow DOE to explore more options in meeting its programmatic goals and thereby increase the quality of these products that are of such concern to the U.S.

- Reduce the cost of achieving a given level of performance in a defense or energy system. It has been well said that time is money. Reducing the time needed to complete DOE programs would be one way to reduce the cost of these programs. DOE is concerned here not only

This article is based on a lecture given at the 1981 Conference on High-Speed Computing, Gleneden Beach, Ore., sponsored by Los Alamos National Laboratory and Lawrence Livermore National Laboratory. The views expressed here are personal views, not the views of the Los Alamos National Laboratory or the Lawrence Livermore Laboratory (referred to here as the Laboratories) or the Department of Energy.



the philosophy behind the machines

SUPER COMPUTERS

IN DEPTH

with the cost of computing for a given project, but with the much larger cost of the project itself.

For example, recent estimates are that the cost of the first demonstration power plant for magnetic fusion will be about \$1 billion. Before such a plant is built, its total operational environment must be simulated to assure that the optimal configuration is used. This will require a supercomputer of greater computational capability than any now available.

• Increase the productivity of the most valuable resource the laboratories have — the scientists and engineers who work on defense and energy programs. As important as computers and other physical resources are, their productivity is of secondary concern to that of people. No computer has yet had an idea of how to make a safer nuclear weapon or a safer nuclear reactor.

Although there is little doubt of the need for this increase in supercomputer capability, we would do well to

bear in mind that improvements in supercomputing include more than just the speed of the computer hardware. There are many examples in which improvements in software and algorithms have contributed as much to large-scale scientific computing as have improvements in hardware. Indeed, with the slowing rate of advance in the speed of semiconductor components, we are faced with an era in which improvements in supercomputing will have to come

largely from advances in computer structures, software and algorithms.

Technology Trends

Innovation in supercomputers is based in part on innovation in the components of which they are built and in part on innovation in the logical structure of the systems. In the past, many of the advances in supercomputers, such as the transition from the Control Data Corp. 6600 to the CDC 7600, were based in large measure on faster components, but this option now seems inadequate.

The major design changes in the Class VI computers are an indication of things to come. Components were not fast enough of themselves to achieve the required speedup, so the structure of the computers was changed to include explicit vector operations. This change in turn required the most far-reaching changes in code structure since the 1950s when floating point replaced fixed point.

The most often-quoted trend in component technology is "Moore's Law," which states that the number of components per chip will double every year [1]. This trend continued for a remarkable number of years. In 1979, however, Gordon Moore of Intel Corp., the author of Moore's Law, noted that since 1975 the number of components per chip has been doubling not every year, but only every two years [2].

Leo Rideout of IBM also notes this slowing rate and comments that "Difficulties in designing circuits of much higher complexity could further diminish the growth rate in the 1980s [3]." The delays encountered in the development of the 64K dynamic random-access memory chips are symptomatic of this trend. The literature is full of the design difficulties and the high costs of developing VLSI components.

There are, of course, always positive announcements coming out of the components industry, and some of the developments made in connection with the Department of Defense's very high-speed integrated circuit (VHSIC) program are especially noteworthy for advances that might be achieved by the middle and latter half of this decade. Gallium-arsenide and Josephson Junction technologies also hold promise for the latter part of the decade. But even the most optimistic views of component development lead us to the conclusion that components will not become faster by two orders of magnitude during the 1980s.

Other Routes

Thus, if we desire faster computers, we are led inevitably to achieving higher speeds in other ways — by changes in the structure of computers, by advances in software, by new physics models and algorithms or by some combination of these options. All of these options have one thing in common — they require major commitments of manpower by the

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All decisions of the judges are considered final and no representations as to their competence, skill or fairness are being made. Deadline for entries is December 31 in our offices in Framingham, MA. All entries become the property of CW Communications/Inc.

HINT: Quality is more important than quantity. Sending in lots of entries will not increase your chances of winning (in fact, reading through a slew of similar slogans from the same person drives us nuts!) Write down everything you can think of that tickles your fancy, then take a while to pick the two or three best ones to send in.

Yes, I'd like to enter your ridiculous button contest. I have read the rules. (I hope your judges can still read when they get to this one.) Here is my entry (if you have more than one, put them on separate forms).

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users.

The first option, changes in the structure of computers, is almost sure to affect supercomputer design in this decade in the form of explicit parallelism. This conclusion has some far-reaching consequences. It means, for example, that the major overhaul of application codes undertaken by the laboratories to take advantage of vector operations may be followed closely by another major overhaul to take advantage of explicit parallelism.

The term "explicit parallelism" is used in contrast to the implicit parallelism that the industry has been using for more than two decades in designing faster supercomputers. Explicit parallelism requires the attention of the user. It cannot be ignored as could many of the implicit parallelism features of the past. Thus, an important part of understanding supercomputing for the 1980s is to understand parallel processors.

Taxonomy and Notation For Parallel Processors

The commonly used taxonomy of parallel processors is that proposed by M. Flynn in 1972 [4] and illustrated in Figure 1. This taxonomy has been quite useful during the 1970s, but it has a serious flaw: the category of Multi-Instruction/Multi-Data (MIMD) includes not one but three separate architectures. To see these hidden architectures, consider Fig-

ure 2, in which we classify computer architectures according to the relative number of execution units (E) and instruction units (I).

With E less than I, we have a shared resource architecture, and a single instance of this architecture has a single execution unit serving many instruction units. With E equal to I, we have a symmetric architecture, which has provided the mainstream of computer design for some three decades. And with E greater than I,

we have a synchronized architecture, in which a single instruction unit synchronizes the work of many execution units.

In Figure 3, we see the multiple forms of these basic architectures that clarify the three MIMD architectures. This taxonomy can be extended to a 12-way classification by classifying the E units according to the number of results that can be generated for each instruction issued: If the results/E-unit/instruction-issued

equal 1, we have a scalar architecture; if the results/E-unit/instruction-issued can be greater than 1, we have a vector architecture.

An Immature Science

Computing is sometimes called "computer science," but its lack of standard taxonomy and terminology is one of the marks of an immature science. Other more mature sciences have systematic taxonomies of the objects with which they deal.

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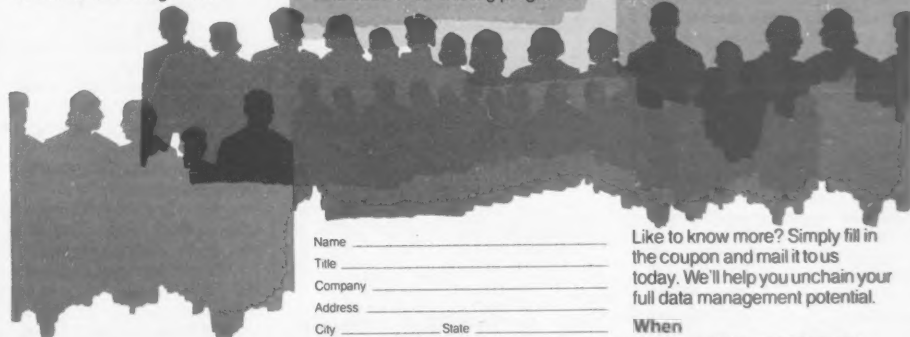


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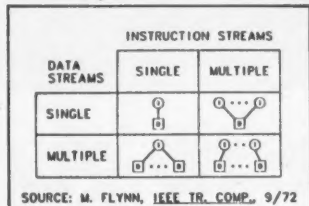
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Figure 1. Flynn's Taxonomy of Computer Architecture

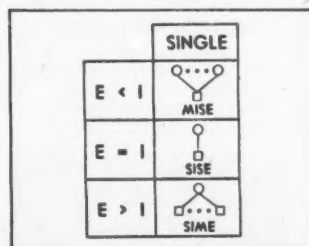


Figure 2. A Basic Taxonomy of Computer Architecture

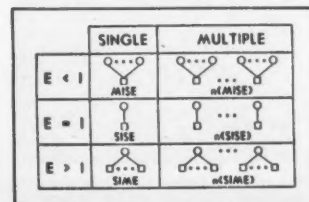


Figure 3. An Extended Taxonomy of Computer Architecture

IN DEPTH

On New Year's Day of 1730, the dean of the University of Upsala, Sweden, found on his desk a manuscript by an unknown student entitled "Preliminaries on the Marriage of Plants" [5]. This manuscript was written by a student named Linnaeus, and it contained an idea for the classification of plants based on their reproductive methods that Linnaeus later used to classify all plants. Linnaeus also devised the binomial system of naming plants and animals using Greek and Latin words. On its way to becoming a science, computing has yet to find its Linnaeus to help it create a standard taxonomy.

Computing, however, does have some established nomenclature. Three items of standard notation for parallel processors commonly used are:

T_p = the time to complete a task using p processors.
 $S_p = T_1/T_p$ = speedup.
 $E_p = S_p/p$ = efficiency.

An Historical Perspective Of Parallel Processing

One of the bits of folklore we often hear in discussions about supercomputers is that our roots lie in serial computation, that parallel computing is an unnatural way of computing, that humans just do not think this way and therefore we will have almost insuperable difficulties making the transition to parallel computation. As is often true of folklore, there is some truth in this statement, but it ignores the frequent use of parallel processing by human beings.

In fact, parallel processing is as natural as preparing a meal. Any cook who has several dishes to prepare, each of which takes a different amount of time to cook, uses parallel processing. The longest-cooking dish is started first, then the second-longest cooking dish and so on, with everything coming out at the same time for the dinner. If a cook can do it, why can't a computer scientist?

Automobile engines are marvels of parallel processing: The fuel and electrical systems must work in parallel, and within each of these systems are many subsystems that work concurrently. If a mechanic can understand and work with parallel processing, why can't a computer scientist?

And, all managers are familiar with parallel processing because they typically control many projects and many people working concurrently on each of these projects. If managers can work with parallel processing, why can't a computer scientist?

It might be argued that these are not calculating tasks and that parallelism in calculation is indeed novel. But is it? In David Kuck's "Survey of Parallel Machine Organization and Programming" written for *Computing Surveys* in 1977 [6], he pointed out a number of historical precedents for parallel processing. For example, Babbage's Analytical Engine was described by Menabrea in 1842 as being

able to prepare several results at once, although there is some question about whether this idea survived. Kuck's paper inspired me to think back on other even earlier uses of parallelism in computation. Some examples follow.

The earliest instance of a parallel processor I can document is the so-called "Salamis tablet," found on the Greek island of Salamis and dated to about the second century B.C. [7]. This device has three calculating po-

sitions. We are unsure how the device was used, but the conclusion is almost inescapable that the three calculating positions must have been used simultaneously, either for reliability through calculating the same result or for faster completion of calculating tasks that had been decomposed into parts.

The Europeans used the line abacus as their main means of calculation until about the 16th century A.D. [7], and the concept of parallel process-

ing was used in these devices. Three of these calculating tables with line abaci incised into their surfaces can be seen in German museums. Each of these has more than one calculating position, as did the Salamis tablet. There are also line drawings dating from the 16th century that show several operators using these positions simultaneously.

We have already noted Babbage's design of the early 19th century. Later in that century, Herman Hollerith



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IN DEPTH

designed for the U.S. Bureau of the Census a tabulator that was quite successful, primarily because he tabulated all of the data on a card in parallel, using 40 tabulators that worked concurrently [8]. For example, if there were 10 items of information to be tabulated on a card, then all 10 of them would be counted at once. The processing elements are quite simple, being just counting devices, but the use of parallel processing is clear.

In the 1920s, A.J. Thompson con-

nected four Trimphator calculators so that the output register of one calculator could provide input to the next to create a difference engine. He thereby created an interesting instance of a mechanical multiprocessor [9].

Punched-card accounting machinery was used for scientific computing at Los Alamos beginning in 1944, and this equipment was used in a parallel computing mode to shorten the time to complete the early weap-

ons calculations. Richard Feynman, later a Nobel Laureate, devised parallel processing methods that increased the throughput by a factor of 9 [10].

Most people have forgotten that the first electronic computer, the Eniac, was capable of parallel operations. It contained 20 adding-storage registers, a multiplier and a divider/square-rooter. The control of operations in the Eniac was implemented through a "master programmer" that

could initiate several operations simultaneously. A description of the Eniac published in 1945 states:

Since the Eniac contains a number of trunk circuits, operations between various pairs of Eniac units can be carried out simultaneously. This is possible not only because of this multiple trunk system, but because all units are synchronized by permanent electrical connection with the "cycling unit." Therefore, if several operations are started simultaneously between various units of the Eniac, and since all of these are timed from one and the same circuit, the various operations will end at known times relative to one another. Thus it is possible to plan the next group of simultaneous operations with the assurance that all of the prerequisite steps of the first group have been completed.

The authors of this report (Eckert, Mauchly, Goldstine and Brainerd) discussed several levels of parallelism, including both single- and multiple-instruction streams. They noted the trade-offs between the speed achievable with "multiple" (parallel) operation and the economy achievable with serial operation [11, pp. 4-3 to 4-5]. They concluded that serial operation was to be preferred in the post-Eniac computers for two reasons: (1) New components were available that were fast enough so the desired speed of operation could be achieved without the complexity and the expense of building multiple processing units, and (2) programming for serial operations would be simpler than for multiple (parallel) operations.

The fact that components are now no longer fast enough for our needs simply requires us to return to the problems faced by Eckert and Mauchly in designing the Eniac. In designing parallel processors for the 1980s, the computing industry will not be starting onto a new path, but merely coming full circle onto an old one.

The descendants of Eniac helped create the impression that computing is by its nature a serial activity. A few designs have incorporated explicit parallelism. Kuck mentions the Bell Labs Model V built by Stibitz and Williams in the late 1940s, a multioperation processor oriented around a drum memory by Leondes and Rubinoff in 1952, a drum-memory multiprocessor proposed by Konrad Zuse of Germany in 1958 and a number of proposed and real multiprocessors in the 1960s and 1970s [6]. Many vendors offer more than one processor in their product lines, including CDC, IBM, Sperry Univac, Honeywell, Inc. and Burroughs Corp. However, uniprocessor designs have been the mainstream of computer architecture for some three decades.

The renewed interest in parallel processing is reminiscent of the phi-

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IN DEPTH

philosopher Plato's theory of learning as *anamnesis*. Amnesia refers to forgetting, but *anamnesis* refers to a remembering of that which has been forgotten. Plato taught that we do not learn new things; we merely remember things we have forgotten. For parallel processing, Plato's point is well taken.

The Problems Of Parallel Processing

In his book *Future Shock*, Alvin

Toffler argues that we can manage the future only to the extent that we can anticipate it [12]. It behooves us to try to anticipate both the problems and the opportunities of parallel processing.

To analyze the problems of parallel processing, I will use one of the fundamental principles of supercomputing, one that I call "Amdahl's Law." In 1967 Gene Amdahl presented a paper to the Spring Joint Computer Conference [13, 14] in which he

warned that when we build computers with two distinct modes of operation, one high-speed and another low-speed, we thereby create a processor whose overall operation will be dominated not by the high-speed mode but by the low-speed mode, unless the fraction of results generated in the low-speed mode can be essentially eliminated. He further argued that eliminating this low-speed fraction would not be feasible in general-purpose computing. Am-

dahl's paper has been widely quoted and sometimes referred to as folklore, but the correctness of the basic premise is easy to establish.

The conceptual basis of Amdahl's Law is illustrated in Figure 4. Here we assume that we have a relay team whose members are a tortoise and a hare. We first have the tortoise run the course of 100 units of distance; it covers the distance in time T , and we show its relative speed as unity. We then have the tortoise run only half of the distance, taking time $T/2$, and the hare — which we assume here is infinitely fast — run the last half of the course in zero time.

We then pose the question, "How fast is the team as compared with the tortoise alone?" If we concentrate on the speeds of the two runners, unit and infinity, we might conclude that the average speed is closer to infinity than to unity. However, if we note that the total time of the team was $T/2$, then it is obvious that the average speed has been increased by just a factor of 2.

If we now have the tortoise run only one-quarter of the distance and the hare run three-quarters, we will increase the average speed of the team to just four times the speed of the tortoise alone. The point is just as Amdahl warned us: The slow member of the team dominates the overall performance.

We can express these ideas somewhat more formally by the following simple analytical model.

$$B = \frac{1}{F_H T_H + F_L T_L}$$

where

B = results generated per unit time,

F_H = the fraction of results generated in high-speed mode,

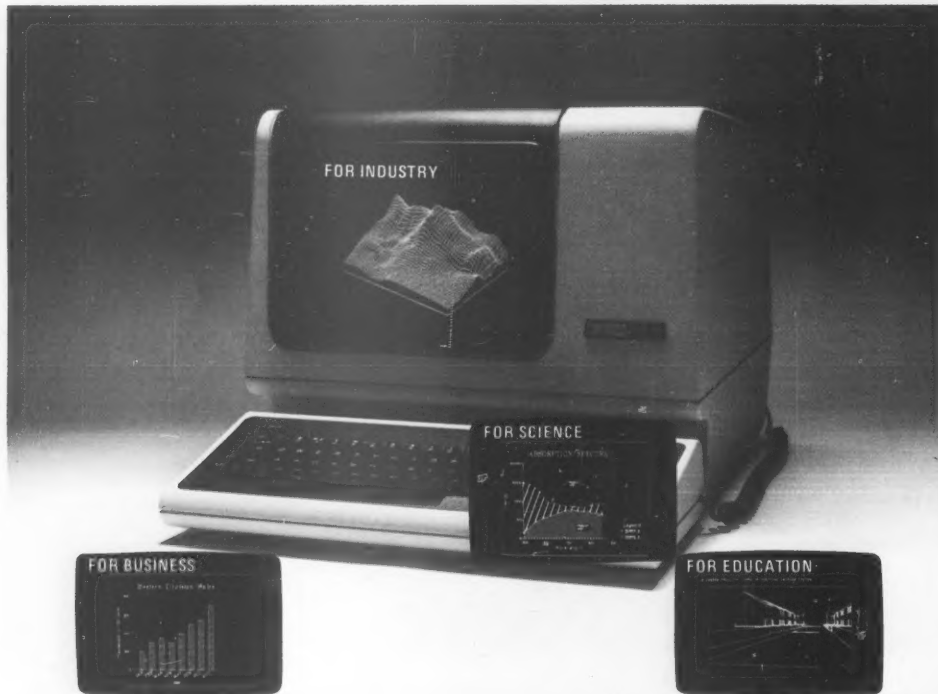
T_H = the time to generate a single result in high-speed mode,

F_L = the fraction of results generated in low-speed mode, and

T_L = the time to generate a single result in low-speed mode.

The validity of Amdahl's Law can be verified by using it to model existing supercomputers. We have done this for the CDC Cyber 205. Figure 5 compares the predictions of the model with benchmark data for the operation $V = V + S$ (vector = vector + scalar), with contiguously stored vectors. The model also has been used to predict successfully the performance of the Cyber 205 for noncontiguously stored vectors and for more complex operations, including the triadic acceleration feature.

If we divide the numerator and denominator of Amdahl's law by T_L and let T_H go to zero to investigate the effect of infinitely fast high-speed mode, we have $B = B_L/F_L$, where $B_L = 1/T_L$ is the bandwidth in low-speed mode. That is, the speed of a computer having two modes of operation is limited by its low-speed mode divided by the fraction of results generated in that mode. For example, if half of the results are generated in low-speed mode, then the



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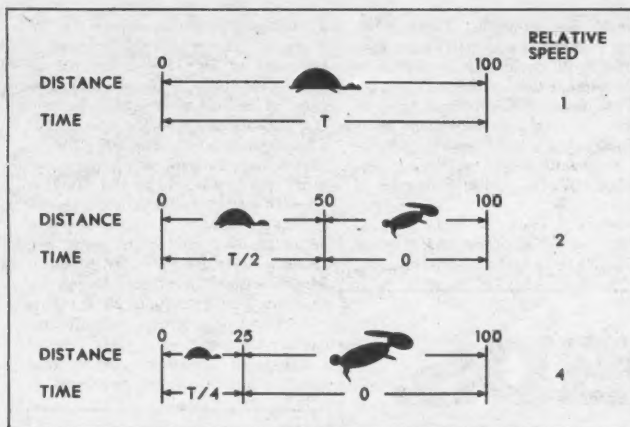


Figure 4. The Amdahl Relay Team

overall performance will be only a factor of 2 greater than if all results were generated in low-speed mode, even if the high-speed mode is infinitely fast.

It is also instructive to divide the numerator and denominator by T_H . We get:

$$B = \frac{B_H}{F_H + F_L(T_L/T_H)}$$

where $B_H = 1/T_H$. This form of the model shows that the ratio (T_L/T_H) has the effect of increasing the fraction of results generated in low-speed mode. That is, the larger this ratio is, the greater is the effect of the low-speed mode, as shown in Figure 6.

This model can be used to explain why the first generation of vector processors was not, and why the second generation is, a marketing success. Figure 7 shows the performance curves of these two generations,

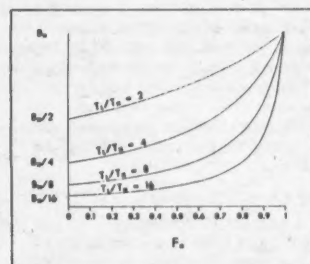
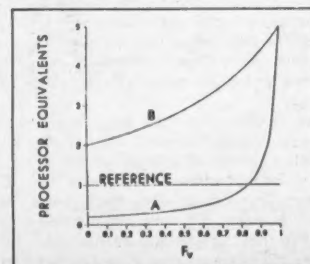
Figure 6. Effect of T_L/T_H on Performance

Figure 7. Performance of First- and Second-Generation Vector Models

compared with a reference computer, the CDC 7600. Here we idealize the first-generation vector processors to have a scalar performance of one-fifth of the reference computer and a vector performance of five times the reference computer (curve A).

The performance curve remains below that of the reference computer until vectorization is about 83%; only with higher levels of vectorization is there an advantage of this type of vector computer as compared with the reference computer. This performance curve does not describe a useless computer, merely one that is special-purpose; superior performance relative to the reference computer can be achieved only when this computer is applied to problems that can be vectorized above 83%.

In contrast, the performance curve of second-generation vector processors is shown by curve B, where we assume the scalar performance to be a factor of 2 above the reference computer and the vector performance to be the same as in the first generation. This performance curve shows an advantage over the reference computer regardless of the vectorization level.

As the philosopher George Santayana remarked, those who will not

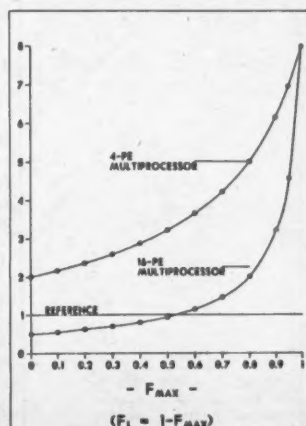


Figure 8. Multiprocessor Options

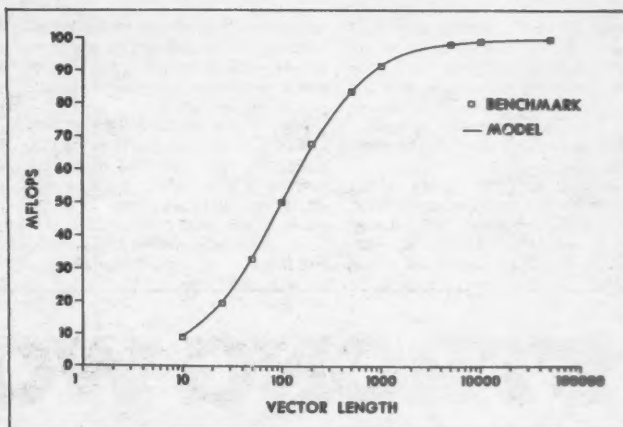


Figure 5. Cyber-205 Benchmark Data Vs. Analytic Model

learn from history are condemned to repeat it, and there is a danger that the errors of the past could be repeated with the technology of the future. For example, suppose a parallel processor is developed that has 16 processing elements (PEs), each of which is a factor of 2 slower than a reference Class VI computer (such as the Cyber 205 or the Cray-1), so the

aggregate of 16 PEs operating concurrently would give a factor of 8 speedup over the reference computer.

If we now assume that some tasks are done by just one PE and the rest are done using all 16 PEs, then the performance curve is as shown in Figure 8. If a code for the reference uniprocessor were converted to run

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on one PE of the multiprocessor, it would run only half as fast as on the reference computer. Even if the code were converted to use 16 PEs for some fraction of the tasks, no advantage over the reference computer would be achieved until that fraction exceeded 0.5.

In contrast, suppose another option were to build a multiprocessor with only four PEs, each of which is faster than the reference computer by a factor of 2. Codes converted from the

reference uniprocessor to the parallel processor would run no less than a factor of 2 faster and at higher factors as the code is converted to multiprocessing operation.

There is a potential fallacy in this analysis, as pointed out by Kuck [15, p. 38]: We have assumed that some portion of the calculation, however small, would be executed in serial mode, that is, with only one PE. This is an assumption rather than a fact, and if it is false, then this analysis is

invalid. For example, if the minimum number of active PEs were four in the 16-PE design, its performance would equal that of the 4-PE design having faster PEs. Optimizing compilers for parallel processors may help us avoid idle PEs and thereby be an important aid in achieving this goal of essentially eliminating serial processing.

However, even a rather small amount of serial processing can significantly reduce the effectiveness of

a multiprocessor, as shown by W. Ware in a paper in 1972 [16] and illustrated in Figure 9. Here we assume that there is some small fraction of serial processing, k , and compute its effect on the speedup of a multiprocessor having 100 PEs.


With no serial processing, the maximum speedup would be 100. However, with just 1% serial processing, the speedup would be reduced to about 50; with 2% serial processing, the speedup would be reduced to about 34; and with 4% serial processing, the speedup would be about 20. It is this reduction in potential benefits resulting from even very small amounts of serial processing that constitutes one of the problems in

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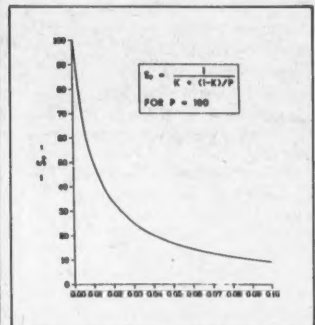


Figure 9. Ware's Model of Multiprocessors

certain parallel processing designs and limits their usefulness to special-purpose computing.

This analysis of potential dangers of multiprocessing leads me to these conclusions:

- There is less risk in the use of multiprocessors having a small number of fast processors than there is in the use of multiprocessors having a large number of slow processors.
- Both vendors and users of multiprocessors should be strongly supporting compiler research for multiprocessors — the vendors to minimize marketing problems, and the users to minimize conversion problems.

The Opportunities Of Parallel Processing

Even though there are problems in the use of multiprocessors, there are even greater problems in not using them; namely, we will not be able to obtain adequate computing capability for our programmatic needs. Only by using parallelism can we hope to achieve speed improvements of one or two orders of magnitude in this decade.

The question of just how much speedup multiprocessing will actually deliver has been a subject of speculation for some time. The most well-known speculation is probably that of M. Minsky [17], who conjectured in 1970 that the speedup attributable to multiprocessing would be limited to log_e of the number of processors used. For example, if Minsky's con-

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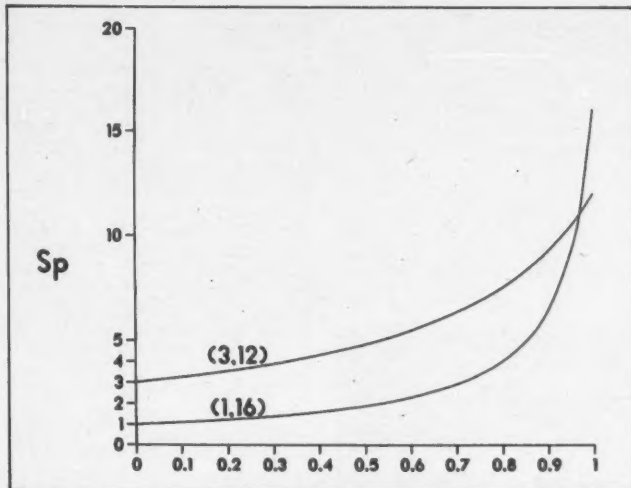


Figure 10. Bimodal Multiprocessing

jecture is correct, 1,024 PEs would provide a speedup of only 10 over serial processing. Except for a small number of processors, this theory now appears to be overly pessimistic.

We can use a multiprocessor version of Amdahl's Law to analyze this potential:

$$S_p = \frac{T_1}{\sum_{i=1}^p f_i(T_1/1)} = \frac{1}{\sum_{i=1}^p f_i/1}$$

where f_i = the fraction of tasks that use i processors. The fractions, f_i , are problem-dependent and we can estimate the range of performance of a parallel processor by assigning these values to them:

- $f_1 = 1$. This defines a problem in which only serial processing is performed; this is the worst case of using a multiprocessor, because there is no speedup.

- $f_p = 1$. This defines a problem in which all PEs are active all of the time; this is the best case of using a multiprocessor, because speedup = p .

- $f_i = 0$ for all i except L and H ,

with L less than H . This is bimodal processing, one instance of which was analyzed in Section 5. For the general case, bimodal speedup = $1/(f_L/L + f_H/H)$. The effect of changing the modes of bimodal processing is shown on Figure 10.

- $f_i = 1/p$ for all i . This is uniform multiprocessing, in which i processors are used for a fraction $1/p$ of the tasks.

R. Lee notes that $H_p = 1 + 1/2 + 1/3 + \dots + 1/p$ is the p th harmonic number; that $H_p = \ln p + .57721 \dots + 0(1) = \ln(1.78p)$; and that H_p goes to $\ln p$ as p goes beyond bound [18]. Thus, for uniform multiprocessing, speedup is given by:

$$S_p = \frac{T_1}{\sum_{i=1}^p (1/p)(T_1/1)} = \frac{p}{\sum_{i=1}^p (1/1)} = \frac{p}{\ln(1.78p)} \rightarrow \frac{p}{\ln p}$$

These categories are summarized in Table 1 on In Depth/13.

In work reported in 1972, Kuck con-

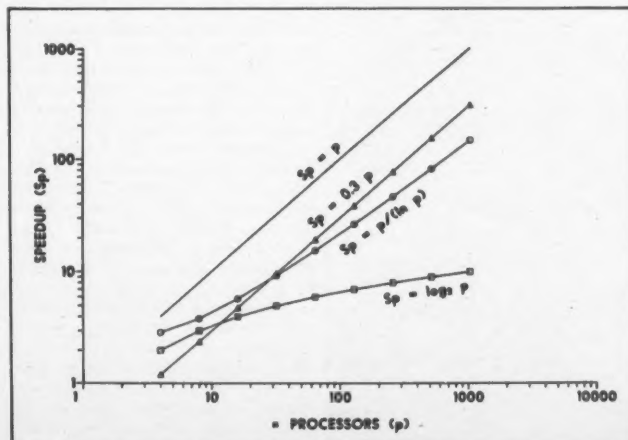


Figure 12. Comparison of Several Speedup Projections

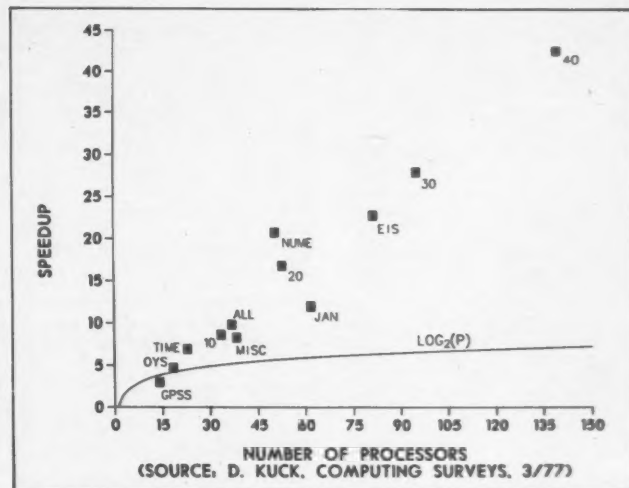


Figure 11. Kuck's Speedup Analysis for Ordinary Fortran Programs

cluded that, for a set of ordinary Fortran programs he studied, it was possible to achieve a speedup of more than 10 using only 32 processors, and that larger programs offered opportunities for even higher efficiency [15]. This data is plotted in Figure 11.

If it is indeed possible to achieve an efficiency of at least 30% for the large-scale application codes used at the laboratories, then multiprocessors with a large number of PEs would be attractive.

Figure 12 summarizes several per-

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formance projections for parallel processors as a function of the number of processors used. For purposes of illustration, the scale for the number of processors has been extended to 1,000. However, a given calculation may reach its limit of parallelism before this number is reached, in which case the speedup would not increase for a larger number of processors.

Whether multiprocessors will be effective for the work of the laborato-

ries is, of course, problem-dependent, and the overall benefits are still unknown. Some problem categories now show promise [19]. However, in making evaluations of the effectiveness of multiprocessing, we must bear in mind Amdahl's original warning. It is not just an algorithm or a set of algorithms that we must evaluate, but the total problem environment, including what Amdahl calls the "data management housekeeping."

Computational Physics: The Software Problem

There are frequent references in the literature to the "software problem" — to problems such as the high variability in the productivity of programmers, the time and cost overruns in the production of software and the unreliable nature of software. Programmers often discuss the software problem in terms of GOTO, IF-THEN-ELSE, modularity and, in general, what is called structured

programming. All of the benefits of structured programming are necessary for the solution of the software problem, but they are not sufficient. Software problems afflict computational physics quantitatively through duplication of effort and qualitatively through the inadequate languages computational physicists are forced to use.

Duplication of effort in software development occurs primarily because so much software is not reusable. In this context, it is helpful to distinguish between ad hoc software and generic software. Ad hoc software is software that is developed for a special purpose, software that is not well documented or tested, software whose existence is not well publicized outside the organization that produced it. It is "throwaway" software [20].

Because of these characteristics, this kind of software is a major cause of low programmer productivity. Even if it were produced with careful attention to the best practices of structured programming, it would still cause low programmer productivity because the same code would be produced repeatedly. Software is often deliberately not publicized to outside parties because of the time and cost needed to prepare it for use by others and because of the worry about external demands on the time of the developer. These are valid concerns, but the long-term effect is to lower the productivity of all programmers.

Generic software, on the other hand, is characterized by:

- The intention to solve some problem so well that it need not be done over again.
- The excellence of the programming that produced it.
- The documentation of its functions, usage information and source code.
- The testing and certification of the code.
- The publication of this information so that others can use it with a minimum of effort.

Examples of generic software are the Eispack [21] and the Linpack [22] routines. For users of eigensystems and linear systems, the excellence of these routines makes it unnecessary to program them again. They constitute a solved problem in software.

Computer science, in general, and computational physics, in particular, are characterized by a relatively small body of generic software and a relatively large body of ad hoc software. This is to be contrasted with science and engineering, in which there is a large body of generic knowledge, with ad hoc investigations aimed at becoming generic knowledge.

In part, this contrast between computer science and most other fields of science is the result of the longer time that scientists and engineers have had to produce generic knowledge as compared with computer sci-



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entists. However, it exists also because programmers are not disciplined to develop generic software. They create programs to meet their own limited needs rather than considering the needs of the larger community of users.

Some programs belong in the ad hoc category because we do not yet know how to do them adequately. Many of the codes used at Los Alamos and Livermore are in this category because the laboratories work at the frontiers of science and they are exploring new fields. It would be premature to package these codes, because they do not represent solved problems. However, even here it is possible to move some portions of these codes into the generic category.

Many of the major production codes at the laboratories are already decomposed into generic code modules of modest size. For areas that are not changing, these generic modules could be used as building blocks for the development of future codes, not only in the organization that produced them, but for others as well. The documentation, certification and publication of these modules would mean that each laboratory could take better advantage of work at the other laboratory and thereby reduce duplication of effort.

An additional advantage of this approach to code development would be that the generic modules might be usable for parallel processing because decomposition of major codes into smaller, independent, generic modules is an important part of converting codes from uniprocessing to multiprocessing.

Another task that needs to be done to solve the software problems of computational physics is the development of a high-level language for the use of physicists. Why is it that it often takes 50,000 to 100,000 lines of Fortran to communicate a code specification to a computer? In part it is because of the vast gap between the knowledge base of a scientist and the knowledge base of a computer.

One indicator of that gap is vocabulary. There are more than half a million words in the English language, and a Ph.D. physicist has a recognition vocabulary of some 80,000 to 100,000 words. By contrast, a child entering school may have a vocabulary of only 3,000 to 4,000 words [23].

A computer system, including the hardware and system software, has a recognition vocabulary that I estimate to be on the order of 2,000 words. Even if we assume that this estimate is off by a factor of 4 to 5, this still leaves a computer with a vocabulary that is an order of magnitude smaller than that of a physicist. The image that comes to mind is one suggested by James George of Los Alamos National Laboratory — Albert Einstein trying to communicate relativity to a child using pidgin English.

One of the reasons why physicists need code developers is that they

cannot communicate directly with a computer at their own level. In a religious context this kind of person is a shaman or priest, someone who can communicate with some mysterious and powerful entity that is impossible for ordinary people to talk to.

Oliver McBryan of New York University, a speaker at a recent workshop on computer modeling at Los Alamos, made the following point [24]:

The present almost universally aw-

ful operating systems and languages have repelled most outstanding physicists and have helped to give the whole area of computational physics a bad name ... A computer language for the use of theoretical physicists should be considerably more powerful than Fortran.

Our commitment to Fortran is almost total, because we have such a large set of working codes in that language, not because of the excel-

lence of the language. Often the attitude is "if it works, leave it alone; if it is fast, it is outstanding" and "better is the enemy of good."

The problem this conservatism causes is well illustrated by the following parable:

A lumberjack was hired at a lumber camp and the first week he cut down more trees than anyone else in the camp, so the foreman was well pleased with his work. The second week, however, his output dropped

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to the same level as the other lumberjacks and the third week, his output dropped even lower.

The foreman called him in to warn him that unless he increased the number of trees he cut down, he would be fired. The lumberjack said he couldn't understand it, that he was working as hard the third week as he was the first week. The foreman then asked him how long it had been since he had sharpened his axe, to which the lumberjack indignantly replied, "Sharpen my axe! I'm too busy cutting down trees to sharpen my axe!"

Just so, by taking the view that we cannot afford to change the way we do things, we run the risk of low productivity — not only for programmers, but, more important, for the scientists and engineers on whose work the success of the laboratories depends.

We must get beyond programming languages to languages that allow scientists and engineers to describe the results desired, rather than merely how to carry out the steps of the computation [25]. A better language than Fortran need not mean abandoning Fortran; a high-level language can be used in conjunction with Fortran. Only when we have such a high-level language will we really solve the software problem for computational physics. We must stop forcing physicists to speak Fortran and teach computers to understand physics and mathematics.

In summary, to solve the software problems of computational physics at the laboratories, we must:

- Decompose our major codes into modules of generic value, so they can be used as building blocks for future use.
- Document, certify and publicize these modules, so that their existence and characteristics are known and they can be used with a minimum of effort.
- Form an interlaboratory library of generic application modules.
- Develop a high-level language for the use of physicists to allow them to deal more directly and simply with computing resources.

Balancing

The Supercomputing Budget

The problems with software for computational physics raise a question about whether we have our budgets for supercomputing in the proper balance. As noted earlier, there are many instances in which improvements in software and algorithms have achieved improvements in supercomputing that match improvements in hardware.

To cite a recent example, Thomas Jordan of Los Alamos found a way to vectorize an equation-of-state interpolation routine that previously was thought to be not vectorizable [26]. He thereby reduced the running time by a factor of 3 to 4 over the original code, and in that one action he advanced the state-of-the-art for

that area by a supercomputer generation.

Unfortunately, there are too few people with these skills. We have an urgent need to hire and train more people to help us achieve similar gains in other areas.

The problem of inadequate support for code development and algorithm research was strongly emphasized in the recommendations of a code review panel at Los Alamos published in January 1981 [27]. Some examples

from the text follow:

Fundamental advances in the capabilities and efficiency of the plasma simulation codes will require basic research in numerical methods. This is perhaps our weakest area at present; adequate manpower is simply not available for investment in long-range studies. . . . The process of winnowing, implementing and testing new algorithms is quite time consuming. . . .

If we wish to pursue numerical research, some augmentation of manpower is essential.

No computer is so powerful that it can carry the burden of inadequate software and algorithms. In the jargon of the street, the word "user" refers to a person who is addicted to some drug and "speed" refers to one of these addicting drugs. The application of these terms to supercomputer users is all too clear: We are ad-

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Another reliable alternative we offer is our superior 160 Mbyte, SMD-compatible Winchester storage drives. These drives have already delivered more than 10,000 hours MTBF. That's twice the reliability that you'd get with an RM03.

We've been achieving optimum disk storage system reliability for 10 years. By constantly evaluating drive technology advances, developing new disk controllers, and supporting all such activities with proper user software, System Industries has earned its reputation for unmatched reliability.

2 You get faster delivery.

We've built our entire business around fast, effective service. And the first step in that procedure is responsive delivery. We provide DEC users with equivalent storage systems in typically 30 days ARO, instead of 180 days.

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3 You save more money.

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For example, two RM03 storage units with a combined capacity of 160 Mbytes can cost you \$50,000. While three of our 160 Mbyte Winchester disk storage drives in support of a DEC VAX-11/780 can give you 480 Mbytes for \$42,500.

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SOME GENERAL MULTIPROCESSING CATEGORIES

f_i	S_p	Description
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$f_p = 1$	p	Maximum multiprocessing
$f_L = 1-f_H$	$1/(f_H/H + f_L/L)$	Bimodal multiprocessing
$f_i = 1/p$	$1/(\ln 1.78p)$	Uniform multiprocessing

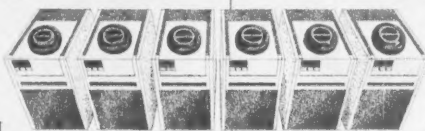
Table 1

4 You get a lot more flexibility.

Flexibility has been one of our key customer benefits during the past decade of supporting DEC users in the field. We've simply eliminated the problem of limited choice.

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5 You can save more floor space.

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dicted to supercomputer speed, and we periodically need a fix of this drug or we have withdrawal symptoms and go to our pushers to convince them to give us another shot.

Computational physics might be healthier in the long term if it were to invest additional resources in algorithm and software improvements, even if this investment requires limitations on hardware budgets.

Conclusions

(1) Increases of one to two orders of magnitude in the operating speed of supercomputers cannot be attained in this decade without changing the logical structure of these computers. This in turn will require major commitments of manpower by users to adapt software and algorithms to the new structures.

(2) There is less risk in the use of multiprocessors having a small number of fast processors than in the use of multiprocessors having a large number of slow processors.

(3) Both the vendors and the users of supercomputers should be strongly supporting compiler research for multiprocessors — the vendors to minimize marketing problems and the users to minimize conversion problems.

(4) The laboratories should decompose their major codes into documented, certified and publicized modules of generic value, so that these modules can be used as building blocks for future use, including parallel processing.

(5) The laboratories should support the development of a language for computational physics that is much more powerful than Fortran. Fortran should not be the only language of computational physics.

(6) The laboratories should place increased emphasis on improvements in software and algorithms, even at the expense of lower budgets for hardware.

Formula for Progress

Progress in technology typically occurs when someone has a vision of how to create new tools and techniques for the solution of practical problems. It is the sweep and the clarity of this vision that carries others along and leads to action. Action in turn leads to a better understanding of the improved technology and the nature of the problems to be solved. Finally, this better understanding alters our vision of what can and should be done. Vision, action and understanding thus form a feedback loop through which we pass repeatedly in the development of new and improved technologies [33].

The laboratories need to formulate their own vision of the future of supercomputing, including:

- A clear understanding of the problems and opportunities of parallel processing.
- The need to support research now to prepare for parallel processing.
- The need to develop generic software for computational physics.
- The need to provide more powerful languages for computational physics.
- The need to provide support for algorithm and software improvements commensurate with our support for hardware improvements.

We need to invent the future, not merely forecast it. We need to visual-

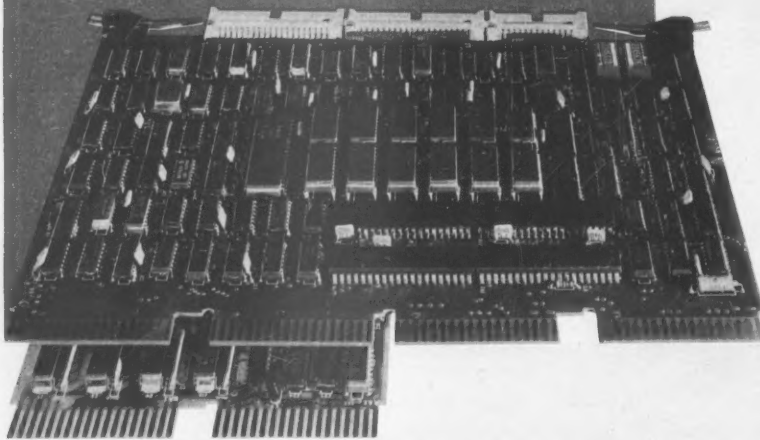
IN DEPTH

ize the future in terms of what could be done and then make it happen.

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Worlton was a member of the joint Los Alamos-IBM design team for the Stretch computer from 1959 to 1961 and served as a national lecturer for the Association for Computing Machinery in 1972 and 1973. He received a B.S. in mathematics and physics in 1953 from Utah State University, where he also did graduate work.



The Black Art of Systems Planning

By Vincent E. Heiker

Information systems planning is a black art that, for a variety of reasons, few firms practice well.

Too often the information systems department prepares budgets and plans without understanding or participating in the company's budgets and plans. Too often the only DP budget guideline is a percent of sales or a percentage increase over the previous year's spending.

Many plans are unrealistic because they assume that hardware can be ordered and installed quickly, that staffing levels can be changed at will with no turnover and that everything will work out fine on the latest state-of-the-art project. The major business functions may be planned little, if at all, beyond the next fiscal year, hardly a sound basis for a long-range information systems plan. Busy information systems staff members often conjure up the plans a few days or sometimes even the night before their deadline.

Perhaps worst of all, many plan narratives are set in prose intelligible only to other practitioners of the mystical craft of data processing, so senior management is frequently reduced to reviewing only the financial portion of the plan rather than its far more important technical, philosophical and architectural objectives.

But some firms have taken a different approach. The information systems plan is developed in conjunction with the business planning cycle as an integral part of each business unit's long-range strategic, tactical and operational time horizons.

The primary purpose of this presentation is to examine the alchemy and sorcery involved in creating successful information systems plans. Secondly, the article establishes preliminary diagrams so that we can continue trying to extend Warnier/Orr concepts throughout the system development process.

The information systems department provides services that enable other departments to carry out their missions. It provides transaction processing, controls, accurate and timely data collection, ad hoc access to information via inquiry, traditional reports and various other decision support services. No matter how understanding the information systems department is technically or skill-wise, it cannot exist by itself, pursuing its own goals and objectives apart from the parent organization.

The organization's business plan tells the information systems planner where the organization expects to be over the next several years. This plan contains information pertaining to expected acquisitions, changes in the number and placement of operating and staff locations, expected growth, environmental and governmental factors influencing the business, competitive forecasts, market forecasts and many other company expectations that should be of extreme importance to an information systems department.

Ideally, the business and information system plans should be developed concurrently because they constrain and direct each other. For example, the number and size of locations will affect data communications approaches. From the other angle, the capabilities of the firm's information

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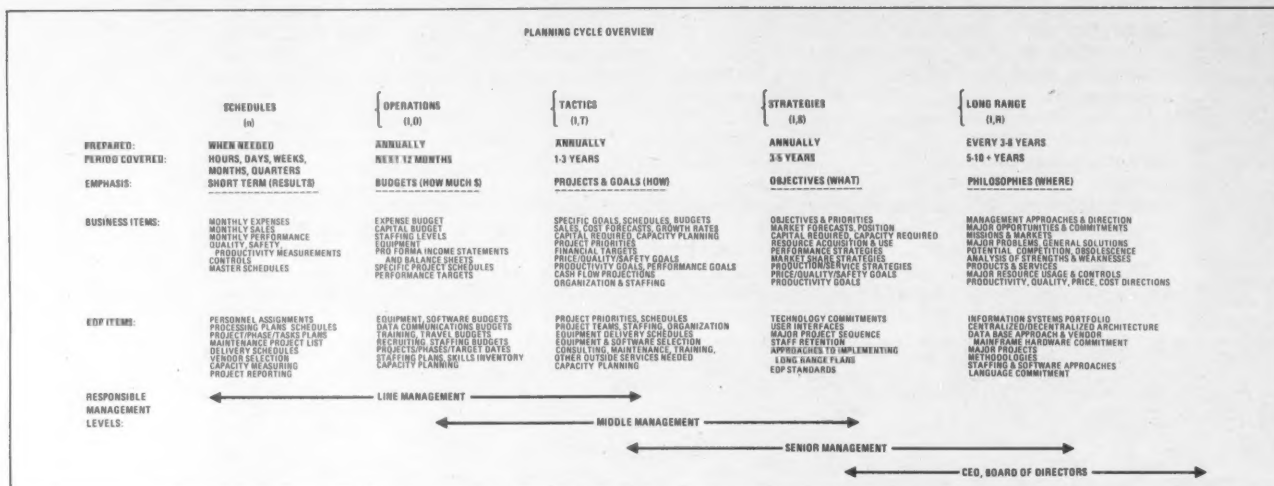


Figure 1. Planning Cycle Overview

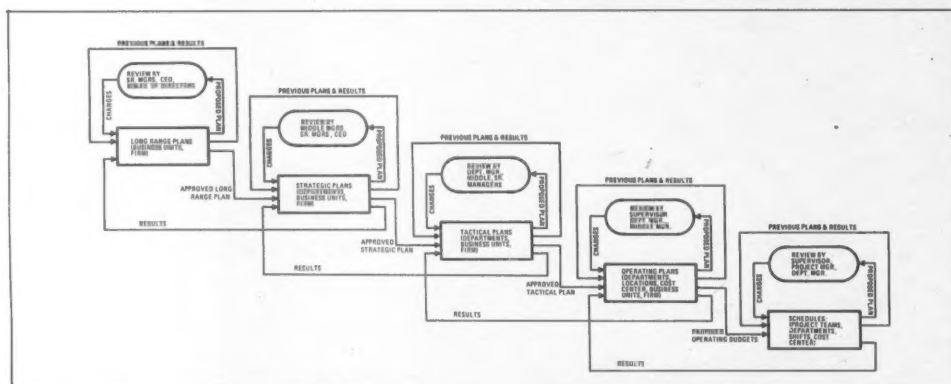


Figure 2. Planning is iterative, recursive and cyclical.

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systems to collect and disseminate information, along with factors like equipment order lead times, may severely constrain management's ability to control and direct business expansion. Most important, the business plans should guide selection and timing of new development projects, which, in turn, drive the planning of information systems resources.

If the company has not prepared a business plan, the information systems planner must attempt to determine the organization's direction and style before plunging into planning for the DP department. Further, the planner must examine the industry environment in which the firm exists to ensure that the plans make sense. Many factors must be considered, including the following:

- **Environment.** Is the firm in a high-technology or low-technology industry? Is the industry new or mature? Is it an oligopoly, a monopoly or does it have fragmented, decentralized markets? What are the requirements for market entry? How aggressive is its competition? What governmental regulation does it face and what is its impact?
- **Company Style.** Is the firm demo-

cratic or authoritarian? Centralized or decentralized? Is its orientation short- or long-term? Does it have formal, rigid procedures or are its communications informal? Is the firm an industry leader with high market share or is it a catch-up firm with low market share? Is it a profit center or a cost center?

• **Financial Situation.** Is the firm undergoing rapid expansion or conservative growth? Is it a cash generator with high return on investment or is it cash-starved and unprofitable?

For example, an information systems department manager attempting to gain approval for a very aggressive, expensive, long-range data processing plan would probably not survive the attempt in an unprofitable, cash-starved company with a short-term outlook and authoritarian style of management. The same manager would also be in serious trouble submitting a large cost-reduction program in a firm undergoing rapid expansion with many growing business controls and communications problems.

Planning Scope

The scope of the information systems plan must be determined in advance by the planner. The scope can be constrained by two organizational factors: the technology to be included and the level of the organization preparing the plan.

For example, the following technologies may or may not be used:

- Voice communications.
- Word processing.
- Office automation.
- Computer-aided design and manufacturing.
- Numerical control.
- Reproduction and printing services.
- Graphics.
- Facsimile.

Organizational level affects the information systems plans significantly. Corporatewide plans differ from division plans, which differ from in-

THE BLACK ART IN DEPTH

dividual location plans, which differ from those of individual departments. When the various plans from each of these different levels of organization are not integrated, the result is inevitable chaos.

In a complex business organization, the degree of cooperation among the business units may also impact the planning scope. The planner may have some cost-effective options if different units can share staff, transfer systems software and business applications, develop common standards, participate in common data communications networks and share hardware.

Rapidly Moving Targets

While it is important for the information systems planner to understand the current business situation, that understanding is insufficient in itself because the business world does not stand still any more than DP technology does.

Long lead times in acquiring computer hardware, changing data communications networks and developing competent staff professionals — as well as the lengthy process required to sell management on development projects — force information systems management to develop long-range plans. Careful planning is required by a moving target. The future holds different technologies, business environments, competition, laws and regulations, economic conditions and staffing issues.

Transforming this many-to-many complex relationship into an understandable, feasible, saleable and useful information systems plan requires a huge dose of black magic. However, with a bit of Warner/Orr alchemy, we can make sense out of the planning process.

Different types of plans are required by different time horizons. Plans are created at various frequencies depending upon the time horizon being considered. The information systems plan should follow the same cycles as the business planning process to ensure correct perspective and to provide a means of mapping the key information in the business plan into the information systems plan, at the appropriate time periods and in appropriate levels of detail.

In its fullest form, the planning cycle consists of several time horizons (see Figure 1):

- **Long-term:** This type of plan usually covers the next five to 10 years. Broad conceptual and philosophical directions are established. Large business problems and projects are identified and assigned tentative general solutions. The basic missions of the company and of its individual units are usually reviewed and redefined. An information systems applications portfolio is often developed as a part of this planning cycle. The plan is updated or replaced every three to eight years, depending upon the success of the previous plan.

- **Strategic:** This plan covers three

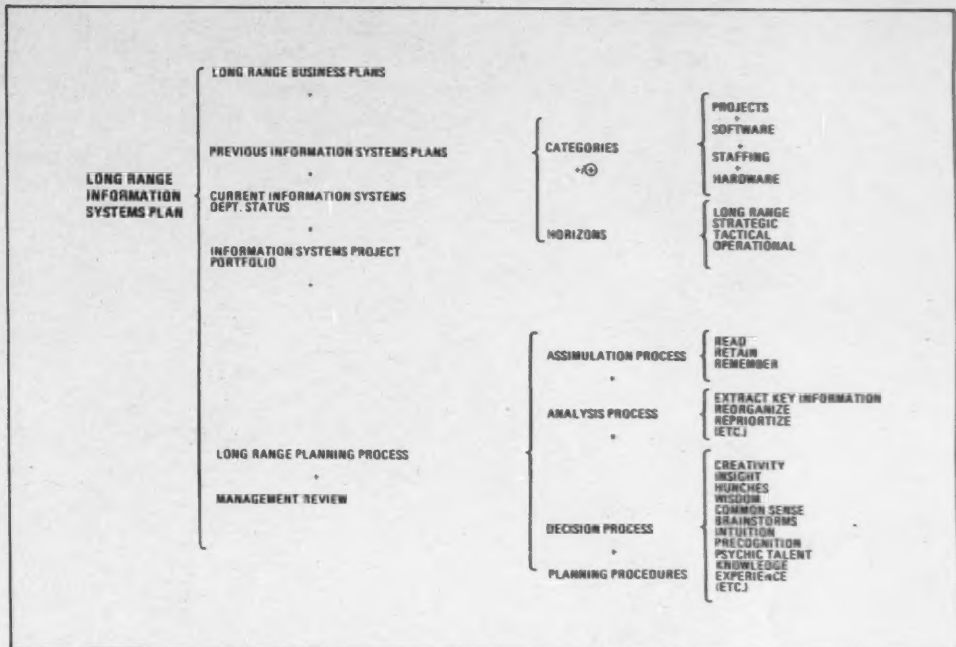


Figure 3

to five years. It establishes measurable objectives and priorities and defines the future in a moderate amount of detail so that senior management can approve the plan with or without changes. The firm's position in the marketplace is examined and its future position is forecast, along with an explanation of the means of reaching the target position. The strategic plan identifies the major resources required to hit the target. Although this plan is prepared annually, major revisions take place only every three to five years, unless there have been unusual successes or failures in the previous year.

- **Tactical:** This is usually a revised strategic plan covering the next one to three years in moderate detail. It includes goals, prioritized projects, resources, target dates and financial information in more detail than the preceding plan. This plan is normally prepared once yearly, but can change several times prior to final approval because of near-term changes, internal or external, to the firm.

- **Operational:** This plan, prepared at least once yearly, is derived from the approved tactical plan and is primarily a control and budget tool. It details specific annual goals and objectives, selected projects with their completion dates and staffing, sales revenues, costs, capital needs and so on for each general ledger account.

- **Schedules:** These are prepared by supervisors, staff experts, line managers and others for use in controlling the day-to-day, week-to-week and month-to-month activities of each function within the organization. These plans can include manu-

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facturing master scheduling, computer operations processing schedules, new development projects, maintenance assignments and equipment delivery schedules. This type of plan is prepared, whenever needed, at a minute level of detail.

It is interesting to note that the output being defined is at a low level of detail (schedules and detailed resource levels) and the input is high-level and generalized. This is precisely the reverse of most processes.

Multiple Plans

Sometimes the plans at each time horizon can include multiple scenarios based on different assumptions. At the operational and scheduling levels this would consist of fallback plans for unusually favorable or unfavorable circumstances.

Multiple plan iterations are usually required before obtaining final approval from the appropriate level of management. Periodically these plans are revised using feedback from the previous period, comparing actual results with those planned for the period. The feedback data relates to factors such as actual sales, profits and costs; projects completed and actions taken by competitors and governmental agencies; vendor performance and human resource changes (see Figure 2 on In Depth/18).

Naturally, to get feedback, the organization must have appropriate measurement procedures. For the business as a whole, information can be gained from the general ledger, sales call reports about competitive actions, market share statistics, production reporting and safety and product quality statistics. For the information systems department, this means tracking hardware reliability and measuring on-line response time, projects completed within costs and schedules, decreased staff turnover and improved user satisfaction. Not all of the measurements need be as tangible as dollars and target dates, but they must be auditable.

Getting Started

To develop the initial information systems plan for an organization, the planner can begin at either or both ends of the planning cycle, depending on time available, the degree of senior management interest (a factor the planner can influence considerably), the existence of a business systems applications portfolio and the availability of detailed information concerning the current information systems department and its functions.

Figure 3 (on In Depth/19), which describes long-range planning, makes this process somewhat clearer. Notice that items such as the previous information systems plan (if one already exists) actually consist of many components at whatever level of detail is necessary for the particular organization. Continuing with this example, the previous informa-

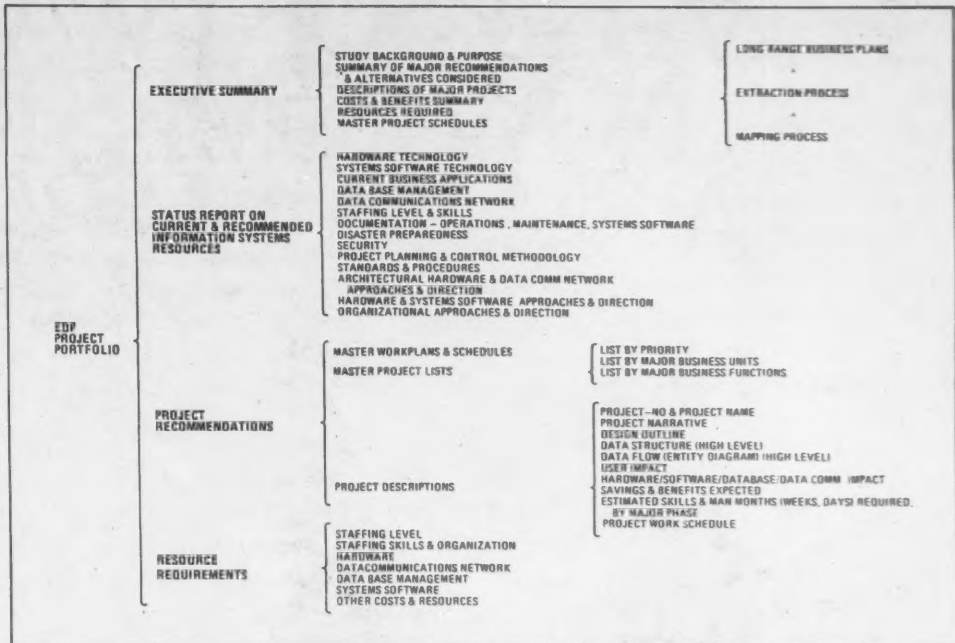


Figure 4

tion systems plan may also consist of all of last year's plans — long-term, strategic, tactical, operational — and/or schedules. Note that this is a form of recursion.

While diagrams aid in understanding, it is difficult to define the assimilation process of the planner, other than to say it involves reading and retention. Further, planning ability consists of many skills, some of which are learned and some of

which are seemingly hereditary or acquired through practice of the black arts.

Planning ability involves creativity, insight, hunches, wisdom, common sense, brainstorming, intuition, precognition, psychic talent, knowledge and sundry transcendental processes, the acquisition of which is not clearly understood. Despair not, however, for many of these strange talents seem to improve rapidly with

experience and practice, similar to witchcraft and wizardry.

Another key component in the long-term planning horizon is management influence on project priorities. This influence takes many forms, ranging from guesses by management and planners to more elaborate committee-based priority decisions.

The other key ingredient and prerequisite, in addition to the current

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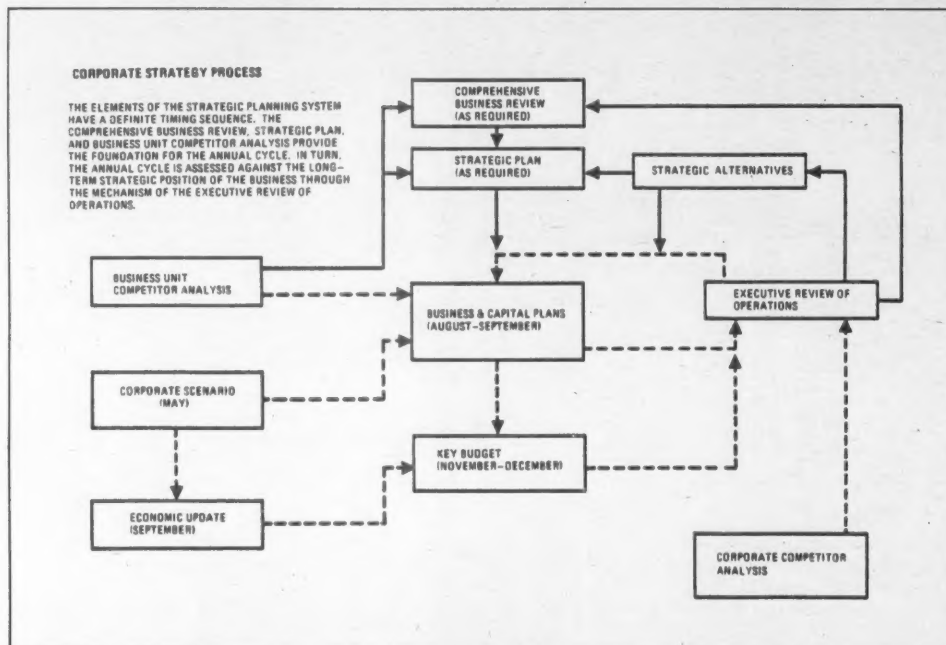


Figure 5

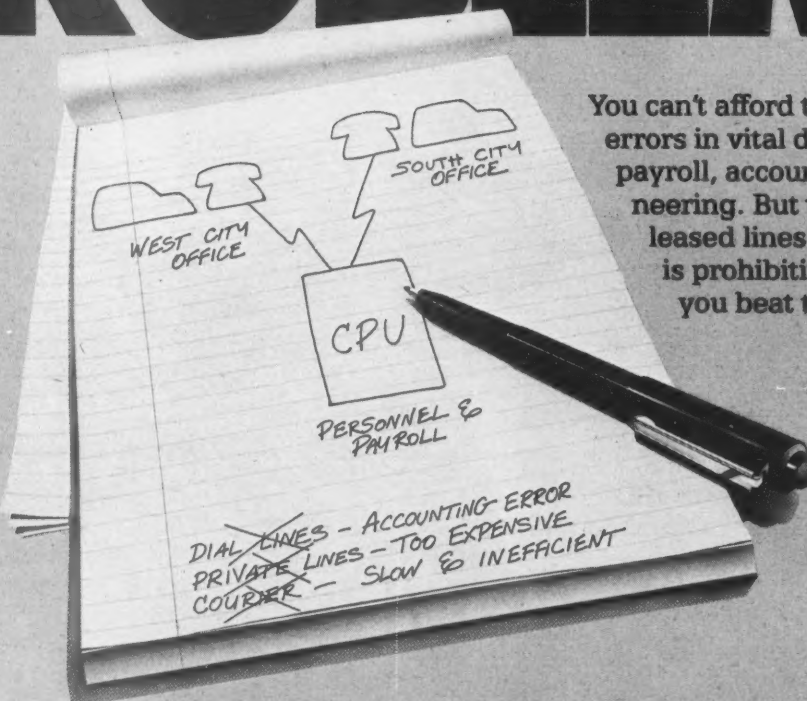
business plans and previous DP plans, is the information systems project portfolio (see Figure 4 on In Depth/21). This is basically a general systems study conducted once every several years.

This study typically identifies the strengths and weaknesses of the current business systems and the information systems department. It focuses on high-level recommendations for improvements, along with accompanying master project schedules, cost/benefit analysis, broad hardware/software approaches and various staffing recommendations. These studies may be conducted with a highly experienced in-house consulting staff or, more frequently, by outside, independent consulting firms whose advice has been sought by senior management.

These studies often have a dramatic effect over the first few years. For a while, the organization makes rapid progress on conversions and major new applications.

After a time, however, the original study degrades in value because of business, environmental and technological changes and must be redone to re-establish the original enthusiasm and rapid pace. The portfolio of

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systems projects must be kept current in order to prioritize major projects intelligently and, from these projects, determine the size of the new development staff, rate of hardware growth, changes in processing and data communications philosophies and similar issues that impact the use of resources.

Mapping Plans

The process of mapping the business and information systems plan can be viewed from an interesting perspective. Figure 5 is an overview of a corporate planning process and Figure 6 is a similar outline of the planning process for information systems.

The comprehensive business review of the corporation and each of its business units corresponds to the development of the DP project portfolio. The strategic plan corresponds to the long-range DP plan. The business unit competitor analysis equates to information systems technology changes impacting long-range DP plans.

The executive review of operations and the strategic alternatives equate to senior management's review of the various information systems

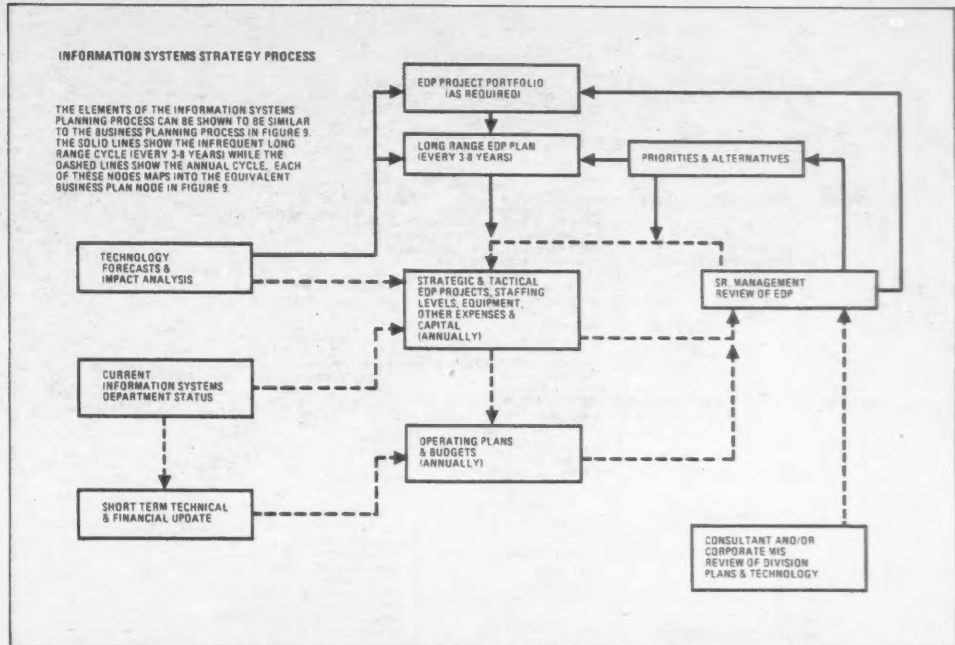


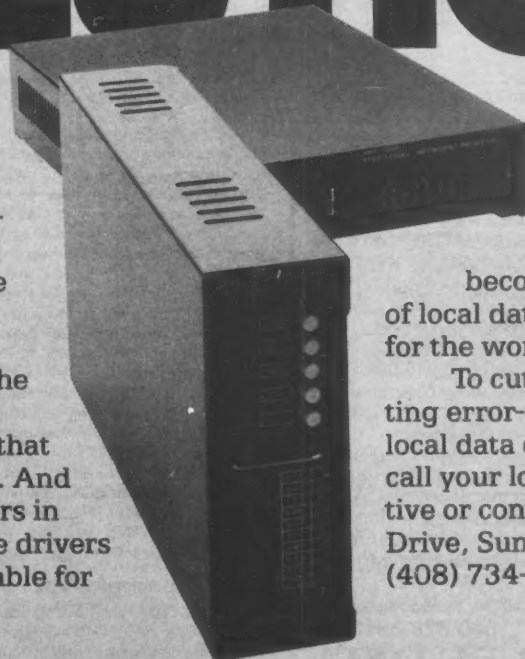
Figure 6

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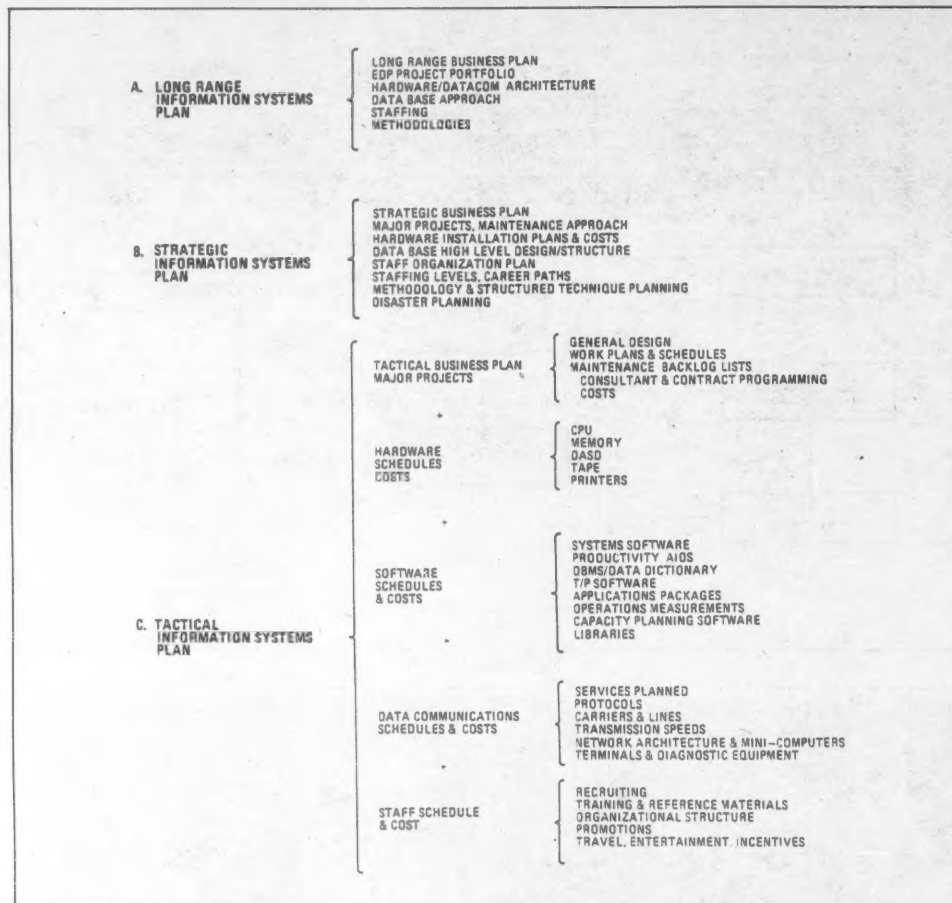


Figure 7A. Changes in Level of Detail and Emphasis as Planning Horizons Contract

each time horizon. There are significant overlaps, but these generally consist simply of different levels of detail.

Obviously, the scheduling level contains the greatest detail and the long-range level the least detail. While a large number of topics are feasible, they generally break into a few major categories:

- Selecting systems projects.
- Software planning.
- Staff planning.
- Hardware planning.
- Acquisition considerations.

Selecting Systems Projects

This process produces a prioritized list of projects that will be initiated, continued and/or completed in the planning horizon time frame (see Figure 8 on In Depth/30). The portfolio of projects includes mostly tangible decision criteria such as costs and benefits, but may also include expert opinions and other intangible factors affecting prioritizing, such as prerequisite systems and technological feasibility. The decisions should be made by a senior management committee, including the information systems manager.

Other factors that affect project scope and technical approaches are more difficult to tie into the diagramming process. Such considerations are generally determined in the long-range or strategic business and information systems plans. These factors include centralized vs. decentralized combinations of approaches, speed of development, costs, plain old-fashioned and highly dynamic politics, sudden external changes in technology or the business environment, unexpected internal management or staffing changes and previous project successes and failures.

Once it has been determined that projects will be started, management must decide how fast to proceed with systems development. This means that the information systems department and/or consultants are expected to supply ballpark project estimates that are usually based on inadequate information regarding project scope and complexity. The same sort of sorcery and entrail readings required for estimating projects is required for the planning processes discussed earlier.

Given the best available project estimates and the best available development time frame at affordable staffing costs and affordable incremental equipment increases, suddenly we are faced with a combined recursion and repetition problem. In actual practice, several scenarios may be prepared at this time with management compromising on development speed and cost levels, balanced against the firm's operational needs and the probability of attaining the tangible and intangible benefits from the new systems.

Software Planning

For each project, many things must be considered in conjunction with

strategies available and the decision-making process among management, consultants, information systems management and invited vendors. The business plan is comparable to the strategic and tactical DP projects and the staffing and expenses associated with them.

Capital plans equate to the strategic and tactical DP hardware selection and capitalized costs. The corporate scenario equates to the current status of the information systems department. The economic update maps to short-term data processing information from vendors, various publications, consultants and so forth and is a last check of strategic and tactical plans prior to input into the key budget. The key budget is the equivalent of the information systems operational plans for the coming year.

Decomposing Plans

Up until now, we have examined the planning cycles and how the various time horizons and business plans can be mapped at a high level into the information systems plan. At this point, we should examine the composition of the information systems plan itself. Figure 7 outlines the major components of the plan for

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the output: an estimate of required staffing, hardware and software expenditures and various supporting tools. Again, these considerations can be charted using the Warnier/Orr technique. The input consists of one or more projects, in priority sequence, plus an analysis process that, in turn, consists of management target completion dates; current expenditures for staffing, hardware and so on; and (a new wrinkle) various philosophies of the firm and the information systems manager.

These philosophies may vary over time and/or by project. They include views on the use of outside consultants and contract programming firms to supplement the in-house staff and attitudes on how the staff should be organized. Other important considerations are the current experience level of the staff available for the project, the existence of appropriate packaged software, current technology in the shop and the learning curve associated with instituting major changes in technology.

From this it can be seen that a project or set of projects can spawn additional projects, such as the installation of new utilities, productivity aids, user-friendly software, ad infinitum. The situation is much like a magician pulling a lot of rabbits (which, in turn, multiply) out of an empty hat. No wonder the project backlog of many firms is growing faster than new systems can be implemented.

Staff Planning

This process should produce figures for the number and cost of people required to provide adequate DP services and to develop new applications within the required target date. This step uses the information identified in the software planning step, plus information required from a step not examined here, in which the computer operations and other supporting staff functions are estimated from other types of input.

A Warnier/Orr representation would show, for example, that the staff acquisition process is subdivided into improving the skills of the in-house staff, transferring users to the information systems department and training them in technology; hiring outsiders; or transferring personnel from other DP units within a larger organization. Each of these items may be further subdivided. For example, developing or improving the skills of people already employed by the firm requires a training expense that must be estimated.

The staff retention process may be subdivided into requirements such as improving the office environment, providing better software tools and providing better turnaround of tests and compiles. The pay levels are determined from external surveys, incremental raises planned for existing staff by guidelines provided in the business plans and so on.

Unfortunately, budgeted staffing

D. OPERATIONAL BUDGET FOR INFORMATION SYSTEMS

BUSINESS OPERATIONAL PLAN

MAJOR PROJECTS
COSTS & SCHEDULES
BY MONTH & WEEK

PHASE/TASK/STEP SCHEDULES & MANDAY ESTIMATES
PERSONNEL ASSIGNMENTS - NEW DEVELOPMENT & MAINTENANCE
INSTALLATION & CONVERSION PLANS & COSTS
USER COMMITMENTS
SAVINGS & BENEFITS
CONSULTING & CONTRACT PROGRAMMING COSTS

DETAILED HARDWARE
COSTS & SCHEDULES
BY MONTH

MONTHLY EQUIPMENT PURCHASES, LEASES, RENTALS, MAINTENANCE,
DEPRECIATION
INSTALLATION SCHEDULE
VENDOR CONTRACTS
SUPPLIES & EXPENDABLES
COMPUTER ROOM CHARGES

DETAILED SOFTWARE
COSTS & SCHEDULES
BY MONTH

MONTHLY SOFTWARE PURCHASES, LEASES, RENTALS, MAINTENANCE
INSTALLATION SCHEDULES
VENDOR CONTRACTS
MANUALS & UPDATES

DETAILED DATA
COMMUNICATIONS
COSTS & SCHEDULES
BY MONTH

MONTHLY CARRIER & LINE COSTS
MONTHLY TERMINAL, MINI COMPUTER, OTHER EQUIP. COSTS
INSTALLATION SCHEDULES
VENDOR CONTRACTS

DETAILED STAFFING
COSTS

SALARIES
BENEFITS
TAXES
TRAINING - CLASSES, AUDIO-VISUAL, OTHER MATERIAL
TRAVEL, ENTERTAINMENT, INCENTIVES
RECRUITING & RELOCATION COSTS
OFFICE CHARGES, OFFICE RENTAL

OTHER COSTS
DETAILED BY
MONTH

DUES & SUBSCRIPTIONS
TEMPORARY OFFICE HELP
INSURANCE
PERSONAL PROPERTY TAXES
TELEPHONE COSTS
WORD PROCESSING SERVICES COSTS
UTILITIES
LEGAL ASSISTANCE
CONVENTIONS & USER GROUP MEETINGS

E. INFORMATION SYSTEMS SCHEDULES

BUSINESS SCHEDULES

PROJECT

PHASE TASK STEP
RESPONSIBILITY
STAFFING LEVEL & ASSIGNMENTS
DATES, COSTS, EFFORT
STANDARDS, TECHNIQUES, PROCEDURES

DAY

SHIFT JOB
RESPONSIBILITY
OPERATOR ASSIGNMENT
PROCESSING TIMES
PROCEDURES & DOCUMENTATION

Figure 7B

levels are only rarely attained, and this fact should be considered in project planning. Black magic works two ways — projects multiply, but staff members disappear.

Hardware Planning

If staff planning is mystical, hardware planning is downright witchcraft. In charting the process, one can divide it into an equipment plan and a facilities plan, each of which will contain subdivisions. For example, the capacity planning process, an essential part of the equipment plan, must take into account all of the above-mentioned plans — for projects, software and staffing.

The physical site facility is often overlooked in strategic and tactical plans. Obviously, office space expansion is required as staffing increases (except that electronic wizards are shrinking mainframes and disk drives). In some circumstances, even the user work areas must be planned in conjunction with the appropriate

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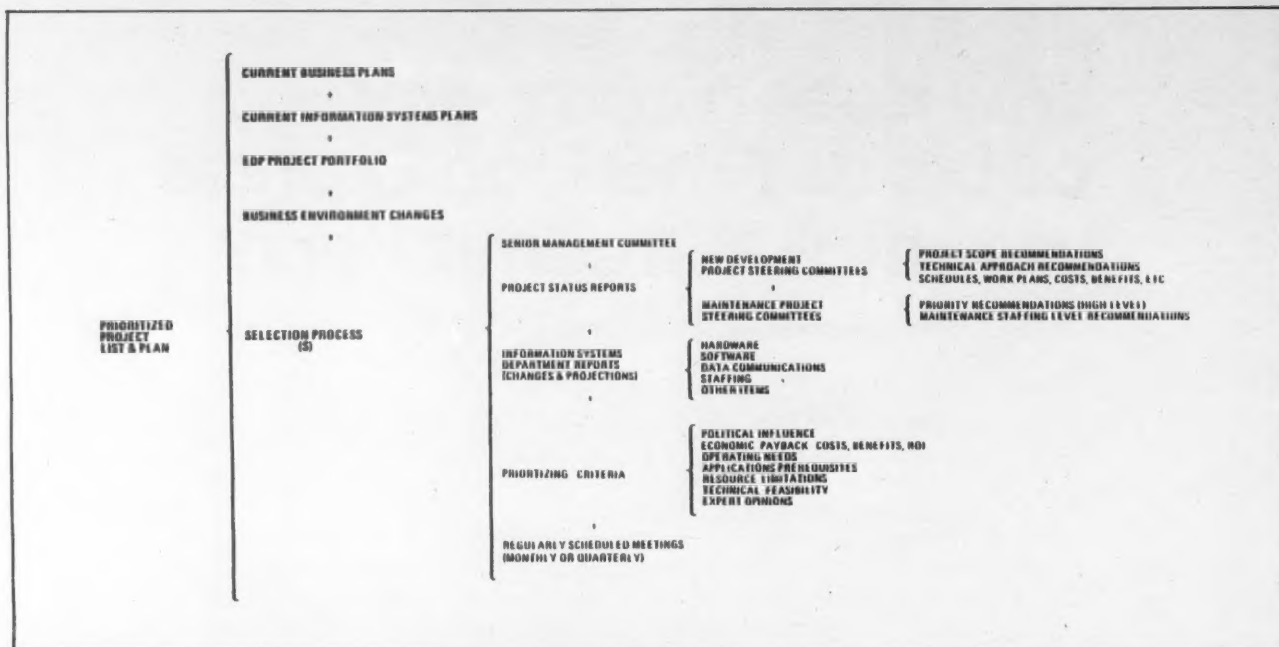


Figure 8

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user manager.

An item as superficially simple as planning a computer room expansion can degrade into considerable complexity if the room is equipped with fire suppression systems, physical security systems, electrical power conditioning, air conditioning, uninterruptible power supply systems and noise and safety controls. Work flow and staff interaction issues further complicate room expansion projects.

In addition to all these components, hardware replenishment cycles and lead time problems can further complicate charting the planning of these three key resources.

Acquisition Considerations

As with staff planning, equipment and software acquisition involves additional complexities. Each may be rented, purchased or leased with many subalternatives. Again, in charting this process, the levels of detail will depend upon the time horizons.

To further compound the difficulties of reducing the information systems planning process to easily understood levels, using Warnier/Orr diagrams, people and paperwork topics need to be examined.

The entire decision-making process consists of various players, including staff experts, consultants, various management levels and various types of steering committees. These decision makers influence project decisions, application support (fancy word for program maintenance) projects and technical and functional decisions within a project in many permutations and combinations.

Each of these players requires many different types and levels of detailed

information and may be influenced substantially by the decision-making process itself. The factors these players must consider include project risks such as pioneering new techniques and technologies; implementation of on-line systems for the first time in a particular user's functional area; degree of the applications' internal technical complexity; complexity and quantity of interfaces among different user functions affected by the application; ability of the information systems staff to handle the project; and external factors such as reporting deadlines established by the government.

Various communications methods used in the planning and decision-making process must be considered. These include formal policies and procedures relating to capital expenditures and approval processes, expense budgeting procedures and approvals, auditing and follow-up practices and other issues that impact the method of plan presentation and progress reporting.

Conclusions

This article is an initial attempt to examine the information systems planning process and to describe, presenting a few examples, how basic Warnier/Orr charting techniques can be applied. The payback for attempting such a task includes:

- A better understanding of information systems planning.
- An extension of the Warnier/Orr method from requirements definition into the project selection process, thereby leading to better criteria in selecting projects.
- A means of teaching future information systems professionals how to

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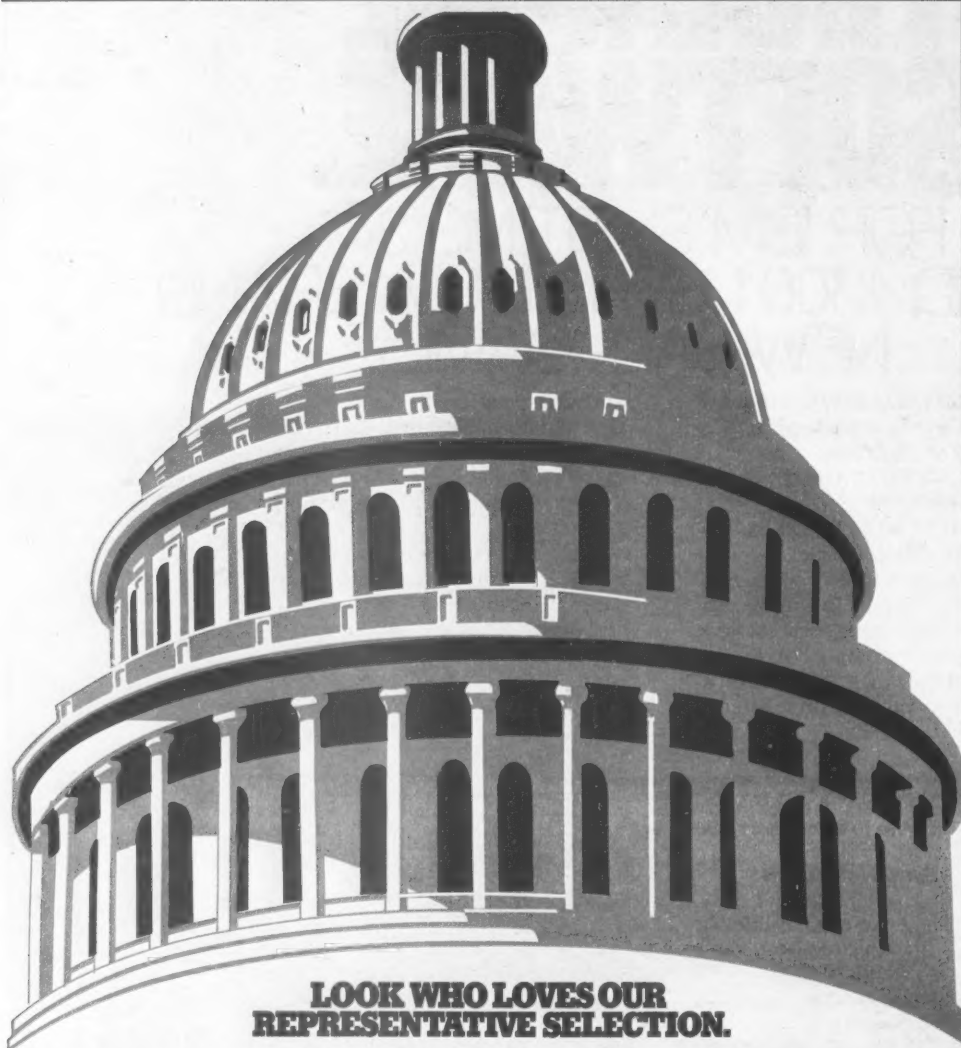
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About the Author

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Heiker holds a B.A. in systems and data processing from Washington University in St. Louis and an MBA from Southern Illinois University at Edwardsville. He has published articles in Datamation, Infosystems and The Journal of Systems Management. He is also a book reviewer for Data Processing Digest.

He is currently project leader, at California Polytechnic University, of a DPMA effort to develop national standards for DP curricula at colleges and universities.



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IN DEPTH

By Michael C. Gemignani

Who's To Blame When The Program Fails?

Theories in Programmer Liability—Part 1



Every programmer knows that any program can fail. Software can fail for a variety of reasons: a logic error — the program runs, but fails to do what it is intended to do; a coding error — the logic is correct, but the source code is incorrect; or a machine failure — for example, transients in the electrical system cause the program to load improperly. These are but three general areas of concern.

With the failure of a program for any reason, however, comes possible legal liability for any damages that flow from that failure. Potential liability for program malfunctions should be of increasing concern to software developers because litigation in this area is increasing and awards to successful plaintiffs can be enormous.

Consider the following situations:

- A defective program supplies erroneous data concerning the amount of insurance that should be carried on a school building. The building burns to the ground, and the one who supplied the erroneous data is held liable for the difference between the building's true value and the amount of insurance.
- A jewelry manufacturer contracts for an inventory control system. Repeated software failures make a shambles of the selling season and cause a substantial loss of business and much ill will among customers. The company supplying the hardware and software for the new system is found to be liable for millions of dollars in damages. The award is later reversed by a higher court for reasons to be discussed later.
- An operating systems error causes a radar computer failure at a busy airport, and a mid-air collision is narrowly averted.

The examples above are based on real cases, and each situation is similar to many others as well in which software failure could, or did, have very serious physical or economic consequences. Despite the increasing threat of litigation, the law of liability for software failure is far from clear. The principal reason for this, of course, is that computers, and hence litigation concerning them, have come on the scene relatively recently. General-purpose, programmable, electronic computers, as a class, are only some 30 years old; in terms of the law, the field is in its infancy.

If computer technology fit neatly into some category with which the law were already familiar, it would pose little problem for the courts. However, given the peculiar nature of computers and software — and the special expertise one must have to understand and use them — courts have had an especially hard time in this area. Representative of this quandary is the legal view of what software is.

All the Difference

What software is, or is not, can make a critical difference as to how a lawsuit is decided, or even upon what theories it is initiated. If a program is deemed to be "goods," then a plaintiff alleging damage caused by a defective program may be able to take advantage of the relatively protective terms of the Uniform Commercial Code. If a program is not goods, but a service, then, unless a court wishes to apply the Uniform Commercial Code by analogy (as some have), the plaintiff may be held to traditional contract law.

On the other hand, such an interpretation may subject the programmer to liability for

malpractice. Yet again, if a program is held to be a "product," then the programmer may be subject to strict liability. And, regardless of whether a program is goods, a service or a product, the programmer may be sued under traditional notions of tort such as negligence, fraud or misrepresentation.

We begin, then, by discussing what a program might be for purposes of liability and what some courts have said about this question. We then begin a discussion of contractual theories of liability. In later parts in this series, we will explore certain other aspects of contract law, other sources of potential liability, the damages for which a programmer might actually be held liable if a suit against him succeeds and the defenses a programmer might call upon to avoid liability if sued.

"Goods," according to the Uniform Commercial Code, "means all things (including specially manufactured goods) which are movable at the time of identification to the contract for sale." Assuming there is a contract for sale — usually an unreasonable assumption since software is much more often leased or licensed — software might, at first glance, appear to be goods. The issue is important because Article 2 of the Uniform Commercial Code, that article which provides substantial protections to a buyer of defective merchandise, generally limits its scope to sales of goods. The issue has not been resolved in the same way by all courts that have addressed it. A moment's reflection, however, reveals that the result depends heavily on the form in which the program is embodied and the legal implications of that result. Consider, for example, a program re-



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corded on magnetic tape. For purposes of taxation, one would want the program to be an intangible asset as were in a state where tangible assets are taxed. The value of the tape will almost certainly be insignificant compared with the value of the program; hence, one would wish to pay taxes only on the value of the tape. On the other hand, if one were buying the tape in order to be able to use the program, then the buyer might well want to consider the tape and

program to be a unit which falls under the purview of the Uniform Commercial Code.

Likewise, if one is buying a computer, the hardware might be considered goods without any legal quibble. The operating systems software might then be considered to be an integral part of the machine, and hence goods. Or it might also be considered to be a service supplied by the hardware vendor, not goods at all.

Similarly, if a company hires a con-

sultant to write a program special to the company's own needs, then what it is buying is primarily a service, the expertise of the programmer, much as a patient buys the expertise of a medical doctor. But it might also be argued that the result of the programmer's effort is something concrete enough to be called a product, even if it is a custom-made product.

Nevertheless, a program seems more closely related to the blueprints of the architect or engineer than to the end result of, say, an automotive assembly line. The law has consistently held that architects and engineers supply a service. But the plans the architect or engineer provide can be used to produce a product, and, if that product is defective, liability might arise. Likewise, even if a programmer is providing a service, the program, if defective, might lead to secondary liability through what is produced through reliance upon it.

View of Contract

One of the questions a court may consider in the resolution of liability is, "What did the parties to the dispute, particularly the injured party, consider to be the nature of the transaction involving the program?" If Company A thought it was buying a complete computerized billing system that would run properly from the time it was plugged in, and this is what the company was led to believe it would get, then a court might find that the system is a product because it had all the earmarks of a product in the minds of the parties. In other words, what the parties think they are contracting for may be critical to the outcome of any dispute arising out of the contract. We, therefore, turn our attention to contracts and liabilities that can arise from the terms of a contract.

A contract is simply an agreement that the law is willing to enforce. In order to have a valid contract between two parties, there must be an agreement, a meeting of the minds as to what is being offered and what is being accepted. Thus, if the parties misunderstand one another completely as to what is being exchanged, there will probably be no contract because there is no agreement, no meeting of the minds. Because the law is generally unwilling to enforce purely gratuitous promises, there must be "consideration" to make the agreement binding. Rarely is consideration a problem in a commercial setting. A promise to pay in exchange for a promise to deliver goods or services is more than adequate consideration.

The vast majority of contracts are carried out without the least dispute, or at least without dispute serious enough to be brought to the attention of a court. However, there are many ways in which contracts can go sour. The particular problem we focus upon is this: Party A has contracted to provide software to Party B, and there is a defect in that software.

What are the potential liabilities of Party A?

No Simple Answer

As one might suspect, the question is complex. For example, Party A sold the defective program to B. Suppose B now sells the program to C. Is A liable to C as well as to B? Or suppose that the contract itself declares that A shall have no liability whatsoever if the program does not work. Can B still recover any damages if his business fails because of inadequate inventory control brought about by problems with the program? Can the workers thrown out of their jobs when B's business folds sue A for lost wages?

A general principle is that the courts favor contracts and will assume that the parties entering a contract knew what they were getting into; this is particularly true in commercial settings. Therefore, if a contract between parties of similar bargaining power dealing "at arm's length" contains a clause that absolves one party of liability for damages if the product or service provided does not work properly, the other party may have a hard time collecting if something goes wrong.

Consider, for example, the following clause, which is part of NCR Corp.'s "Universal Agreement": "These provisions are intended to state all of the rights and responsibilities between NCR and customer. They take the place of and supersede all warranties, express or implied and whether or merchantability, fitness or otherwise. The remedies herein contained are exclusive. Customer and NCR waive all other remedies including, but not limited to, consequential damages."

No attempt to single out NCR should be implied because most hardware or software vendors use similar clauses; but many key problems that might arise in a contract dispute are touched on in the one paragraph cited.

Merger Clauses

The first sentence of the paragraph is a form of "merger clause." This clause states that the written contract is to be the embodiment of the entire agreement between the parties; hence, one of the parties is not to be permitted to appeal to alleged agreements made apart from the writing itself. If the writing states that the bookkeeping system requires a machine with 256K bytes of core memory, but the salesman absolutely assured the company that the system would run with 96K, the written contract provision governs. The buyer may have grounds for suit based on fraud or misrepresentation, but not for breach of contract.

Breach of contract occurs when one of the parties fails to perform according to the terms of the contract itself. If side agreements can be shown to have become part of the contract, even if not committed to writing,

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then they must be honored as well to avoid breach. Merger clauses attempt to prevent side agreements or exaggerations of sales staff from becoming contractually binding.

If one must be found liable, liability under breach of contract is probably the least harsh in its results. If the breach is material — in essence, no performance has been rendered — the nonbreaching party has a choice of several "remedies," that is, ways to obtain satisfaction. He may treat the contract as void and simply forget about it. Or he may obtain what was contracted for from another source and sue for the difference between the new cost, if higher, and the contract price. The nonbreaching party may also seek certain other damages, such as the cost of negotiating a new contract with another party or, in some instances, lost profits caused by the breach.

Generally, damages would be limited to those that can actually be proved to have followed directly from the breach, and such damages would also have to be proved as to their amounts. Mere guesses without substantiating evidence will not do. In fact, if the nonbreaching party cannot prove that real losses were incurred, then it cannot recover anything at all. The anger or inconvenience alone that might come from the breach is not sufficient for recovery; hence, many breaches of contract will go unpunished simply because the cost of pursuing legal remedies is more than what can be shown in the way of damages. Unfortunately, attorney's fees are not usually recoverable in a breach of contract action.

One may still have performed ac-

cording to the terms of the contract well enough to avoid a total breach, but not sufficiently well that all of the terms of the agreement are satisfied. It may be, for example, that the promised program was delivered and ran, but it was delivered late; or perhaps the program was delivered on time, but cannot carry out some of the functions it is supposed to.

If there has been substantial performance by one party, the other party is bound to perform its terms of the

contract. Unfortunately, there are no hard and fast rules to establish substantial performance. If a program runs well except for some particular subroutine, it might be for a court to decide whether, in the total context, that subroutine is so important that its failure represents a complete breach on the part of the programmer.

If it is not a total breach, then the buyer must pay for the program; but the buyer may also counterclaim for

damages. He may seek the difference between what the program is worth as delivered and the contract price. Or he may contract with someone else to correct the program and sue for the cost.

Another Option

He may also seek the costs directly incurred because of the defect in the program. If, for example, a bookkeeper must be hired because the program cannot keep his books, then



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at least part of the bookkeeper's salary would also be recoverable.

Breach of contract in itself is often the least painful of the routes to liability, despite the fact that litigation is never pleasant and very seldom cheap. A contract too, as does NCR's, may seek to limit the remedies that can be sought. It may state that the sole liability that will be incurred by breach on the part of the programmer is the purchase price of the program, or even some fixed amount in

so-called "liquidated damages." The contract may state that the action for breach must be raised within a certain time period, say one year, after the breach occurs. If the breach is defined to occur at the time of delivery, then the program user will be left without a remedy at all if a fatal flaw in the program is not found until more than a year after the user accepts the program.

The contract may further state that the parties will submit any dispute as

to the substance of the contract to binding arbitration; hence a party seeking to enforce the contract in a court of law may find itself sharply limited in what kinds of issues the court is willing to consider.

According to classical contract law as well, rarely can one obtain consequential damages. Actual damages are concretely determinable damages that can be tied immediately to the breach. The increased cost of buying alternative services is such actual

damage. Other damages are more remotely related to the breach or tied to it by more tenuous causal threads. For example, the lost wages of workers thrown out of work by a program failure are such consequential damages. Usually, lost profits are also included under consequential damages as well.

Consequential damages can be recovered if they are known and foreseeable at the time of contracting. Consequential damages, because they can extend like ripples in a pond, can be catastrophic in size. Naturally, most program suppliers, like NCR, would like to contract them out of the picture.

But breach of contract may result in injuries to noncontracting parties. A hospital may contract for software to monitor patients in intensive care. If the software is defective, a patient may die. The patient never did have a contract with the software supplier. Can the estate sue for damages? It cannot sue the programmer under a breach of contract theory because it has no contract with the programmer. Here, then, is where some of the greatest liabilities and, hence, some of the touchiest legal issues lie.

Surely, someone injured by a defective program should have some recourse for damages other than through breach of contract, particularly if the injured party does not even have a contract with the software supplier. What, then, are some theories of liability other than mere breach of contract, which, as we have seen, can be extremely restrictive? We will look at this question in the next part of this four-part series.

About the Author



Michael C. Gemignani holds a Ph.D. from the University of Notre Dame and a J.D. from Indiana University. Formerly chairman of the Department of Mathematical Sciences at Indiana University-Purdue University at Indianapolis, he is currently dean of the College of Sciences and Humanities at Ball State University. Gemignani is a consultant on computer-related law and has given many presentations on the subject.

His book, *Law and the Computer*, appeared last April and was published by CBI Publishing Co., 51 Sleeper St., Boston, Mass. 02210.



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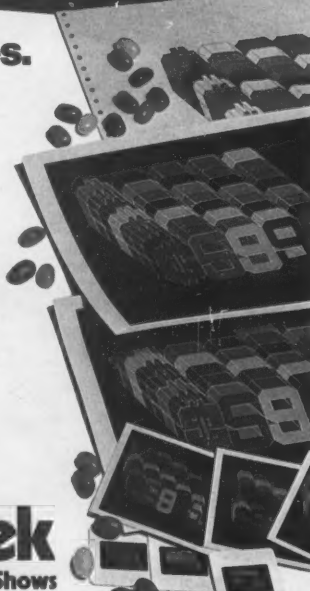
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To Discontinue Development?

Honeywell Silent on Future of Multics

By Jeffrey Beeler

CW West Coast Bureau

Does Honeywell, Inc. plan to discontinue development of its Multics operating system?

At the moment, almost no one can say for sure. For the record, Honeywell last week declined to comment on recent, widespread rumors that its ongoing Multics development project is destined to get the ax, possibly as early as late next year.

"It is Honeywell's policy not to comment on future development programs or on development project funding levels," a company spokesman said.

But the firm's refusal to either confirm or deny the rumor follows hard on the heels of an internal Honeywell announcement that suggests Multics' days as a growing product may be numbered. The gist of the announcement — which is believed to have taken place simultaneously at Honeywell's Multics development centers in

Phoenix and Cambridge, Mass. — was that efforts to continue expanding and enhancing the operating system would soon cease.

However, the announcement was never made public and was later retracted when Stephen Jerritts, Honeywell Information Systems, Inc. president, failed to comment on the rumor at the firms' latest large-systems users group meeting in Los Angeles.

During the meeting's keynote address on Oct. 5, Jerritts reportedly told the users group that Multics' latest version, Release 9, had just gone out the door and that work on Release 10 had already begun. Then, after what one member of the audience described as a "noticeable pause," Jerritts turned his attention to other matters and reportedly never alluded to Multics' future beyond Release 10.

Thus, the operating system's status as an ongoing product seems virtually assured, at least until late 1982, when Release 10 is

most likely to make its debut. But beyond that date, the question of Multics' survival remains open to speculation.

On one hand, Jerritts' upbeat references to Releases 9 and 10 left the unmistakable impression that Honeywell still stands behind its operating system 100%. On the other hand, his failure — intentional or otherwise — to categorically deny the Phoenix and Cambridge announcements might lead an anxious user to suspect that rumors of Multics' future demise have at least some basis in fact.

Even if Honeywell does finally decide to kill its operating system after Release 10, support for Multics versions already in the field is unlikely to be affected. "We are continuing active marketing and support of our Multics product line," a company spokesman said last week in an official statement. "It is Honeywell's policy to provide for the continuing support needs of our existing customers on Multics and on all our products." The main impact of any decision to further halt Multics' development work would likely be to deprive many of the operating system's users of a path for future upgrades.

Highly rated as a program development system, Multics boasts approximately 30 very large users, many of them in countries other than the U.S. The product's customers run the gamut from universities to large businesses to military agencies.

Western Electric JCL Generator Supports Recovery of IMS Files

NEW YORK — Western Electric Co. has announced the Data Base Backup and Recovery-Job Control Language Generator

(DBBR-JCLG), which it said supports data base integrity operations for users of IBM's IMS data base management system (DBMS).

DBBR-JCLG reportedly automates the process of writing or revising the JCL for backup and recovery of IMS files. The software obtains the description of the IMS data bases directly from the data base description or program specification blocks of IMS. It uses this information to create JCL for image copy, restore, unload, reload and backout jobs.

For those installations using the IMS Data Base Recovery Control (DBRC) feature, DBBR-JCLG can create the input necessary to initialize or reinitialize the Recon data sets, the vendor said. A special command also is available to allow DBBR-JCLG to interact directly with DBRC to generate restore JCL.

The JCL generator can be used in either an on-line or batch mode. The latter requires the OS/VS2 MVS TSO command package.

DBBR-JCLG runs on any system under MVS with the IMS/VS DBMS. DBBR-JCLG software for both the batch and the on-line modes can be acquired from Western Electric for a one-time rights to use fee of \$8,000 per data center.

Western Electric can be contacted through P.O. Box 25000, Greensboro, N.C. 27420.

JCL Generator Works at OS Sites

DALLAS — University Computing Co. announced UCC Twenty, an OS JCL generator. The package was designed to automatically enforce OS JCL standards, reduce the time expended for OS JCL creation and allow inexperienced personnel to create valid OS JCL.

As much data as possible is taken from the user-defined defaults carried on the UCC Twenty standards file, the vendor said, noting that default values need defining only once.

UCC Twenty handles syntax and keywords automatically, and the standards file contains default values for many JCL parameters, according to the vendor.

The software package is sold with UCC Two in support of the DOS to OS conversion effort.

UCC Twenty is available only to new or current UCC Two clients and is priced at \$8,700 or \$385/mo on a 36-month pay-out plan, the vendor said from UCC Tower, Exchange Park, Dallas, Texas 75235.

Retrieval Systems Built for OS, DOS

MONTVALE, N.J. — Information Science, Inc. introduced two on-line interactive retrieval systems, GRS On-Line and GRS Executive, for IBM and plug-compatible systems operating under OS and DOS.

GRS On-Line reportedly will work against any Vsam file and can be used for both standard and ad hoc reports. The GRS Executive System provides an alternative means of access that is geared to nontechnical users. The software is said to interpret questions and produce reports and prompts the user for further clarification of requests.

GRS On-Line and GRS Executive will be available for OS users in the second quarter of 1982. GRS Executive for DOS users will be ready in the third quarter of 1982. The systems can be used with either the vendor's own human resources system or other human resources systems.

Pricing is in the \$40,000 range for each package, the vendor said from 95 Chestnut Ridge Road, Montvale, N.J. 07645.

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such comprehensive support, including interfaces with ACF2 (the leader in security systems), SPF, TLMS II, TMS, and RACF.

Let ASM2 make molehills out of mountains when it comes to managing your installation's DASD resources.

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Cullinane Enhances 'Culprit,' 'EDP-Auditor'

WESTWOOD, Mass. — Cullinane Database Systems, Inc. has added features to its Culprit report generator and its EDP-Auditor library of rou-

tines that reportedly provide greater ease of use, improved security and enhanced performance of its EDP-Auditor software.

EDP-Auditor combines Culprit with the library routines and is designed for use by auditors and auditing departments. It is a component of Cullinane's audit information management system and is integrated with the vendor's information directory.

Culprit, for use with IBM or plug-compatible systems, is a management tool for ad hoc reporting, as well as a retrieval system. Its new features are said to include automatic decimal-point alignment, full-decimal arithmetic, a CALL statement for simplified coding, automatic table lookup and security facilities that utilize the integrated data dictionary.

The EDP-Auditor library of routines is a set of Culprit routines.

More than 20 new routines have been added, the vendor said.

The new capabilities include gap detection, which highlights missing numbers in any computerized file; random number generation and standard deviation; and DOS/VS accounting reports that allow DOS/VS users to analyze job-accounting information and ascertain that computer resources are being properly allocated.

For nonusers of Cullinane's integrated data management system (IDMS) the price is \$20,000. IDMS users who do not have Culprit can obtain the enhanced software for \$25,000, the vendor said from 400 Blue Hill Drive, Westwood, Mass. 02090.

Upgraded 'Panexec' Boasts Simplified Installation

OAK BROOK, Ill. — Pansophic Systems, Inc. announced the release of Panexec 4.0 that reportedly includes simplified installation and eliminates the need for the software to reside in a link list library.

The requirements for I/O appendages and for the authorization of Panexec also are eliminated, the vendor said.

There are no required assemblies or link edits, and no modules are required in the fixed or pageable link pack area. Initial program load requirements have been removed with the exception of VS1.

Single Read

Panexec uses a single read to retrieve all segments on a track from a Panexec library. With Release 4.0, the %Fileopt command can be used to specify when execution information for elements executed from a Panexec library is to be updated, according to Pansophic.

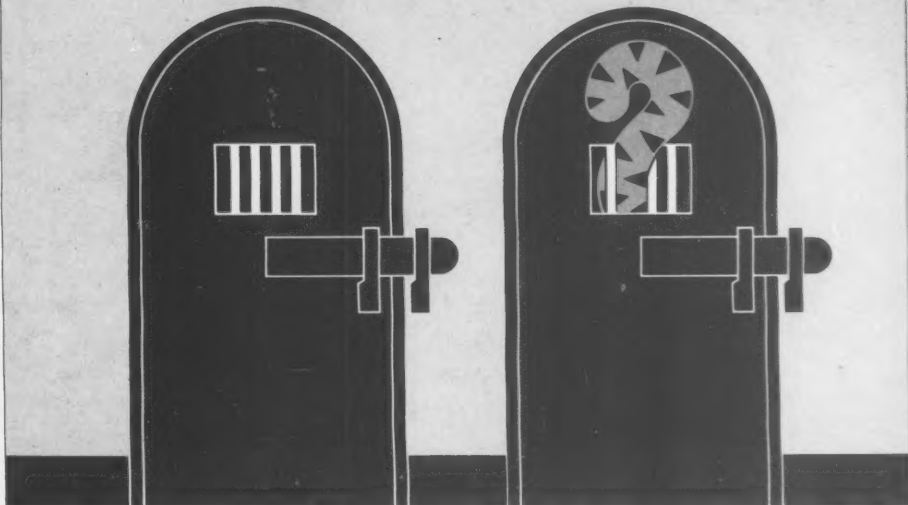
Panlink is provided as an alternative to %Link, the vendor continued, and invokes a version of the supplied IBM link editor. Panlink is said to support all capabilities of the IBM link editor.

Panetrev reportedly has been upgraded to use the latest version of Easytrieve/USIO. In addition, 3380 di-

rect-access storage device is supported for Panexec libraries, OS partitioned data sets and sequential files.

Release 4.0 of Panexec is being supplied at no charge to current users of the software, Pansophic said from 709 Enterprise Drive, Oak Brook, Ill. 60521.

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BIMMONTR DOS/VS(E) System Status and Queue Display

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Packages Run On DG's MV

WESTBORO, Mass. — Data General Corp. has announced its DG Eclipse MV family of 32-bit minicomputers will support 15 scientific applications offered by outside vendors.

The packages include IMSL Fortran 77 mathematical and statistical libraries from IMSL, Inc.; Release 4 of the Ansys engineering analysis program from Swanson Analysis Systems, Inc.; Release 9 of SPSS mathematical and statistical libraries from SPSS, Inc.; and the SAP 7 structural analysis software from the University of Southern California, DG said.

Packages are priced according to system configuration, DG said from 4400 Computer Drive, Westboro, Mass. 01581

Relational Data Base/WP System

'Sequitur' Targets PDP-11, Onyx Users

BERKELEY, Calif. — Pacific Software Manufacturing Co. here introduced an integrated relational data base manager/word processor called Sequitur.

Sequitur is a data base system that uses screen editing for all operations and includes text processing facilities. It is written in the C programming language and currently runs under the Unix operating system on Digital Equipment Corp. PDP-11 systems and Onyx Systems, Inc. Onyx computers.

The package reportedly organizes data in rows and columns and displays it on the screen in the form of tables. Data also may be viewed one row at a time in "file card" display

style.

It provides a single screen-editing interface for all interactions with the system, including entering and editing data, modifying the data dictionary, entering queries, specifying reports or form letters or giving commands. The user edits data on the screen as if using a word processor, the vendor said.

Sequitur reportedly performs virtual operations, which means that duplicate files are not created for the results of data base operations. It is said to give users the tools to design data bases for data entry and retrieval. Integrated utility programs provide for backups to system files, batch transfer or data to or from other systems,

and recovery of unused disk file space.

For the Onyx computer, the complete Sequitur system sells for \$3,495. DEC PDP-11 installations start at \$5,495, the vendor said from 2608 Eighth St., Berkeley, Calif. 94710.

Line Editor For DEC CPUs 1100-Compatible

MILWAUKEE — A general-purpose line editor software package for Digital Equipment Corp.'s PDP-11, LSI-11 and VAX computers — said to be command-compatible with the ED processor on Sperry Univac 1100 computers — is available from Computing Techniques, Inc.

Designed for users who cannot or will not use full-screen editors, Cted reportedly allows editing of an entire file, rather than a single page or screen at a time.

Cted runs under the RT-11, RSX-11M, TSTS/E, VMS, TSX and TSX-Plus operating systems and is written in Fortran. The software is available under license for \$1,250 in executable format; media charges are extra. Inquiries should be addressed to Computing Techniques, Inc., P.O. Box 14127, Department S4, Milwaukee, Wis. 53214.

Data 21 Updates Print Facility

GARDENA, Calif. — Data 21 has enhanced its Remote Print Facility (RPF) package to allow users to submit specified jobs to run in batch.

The package, designed to interface with IBM VSE/Power queues, enables users to display or print reports on IBM 3270 terminals, the company said.

The enhanced version mandates jobs be subject to strict security and controls, such as class, priority and disposition of output, all defined by the DP department, according to the vendor.

RPF is priced at \$6,000 or \$250/mo from Data 21, 15514 Ogram Ave., Gardena, Calif. 90249.

Program Generator Aids MSI Users

COSTA MESA, Calif. — MSI Data Corp. has announced an automatic program generator for users of the firm's hand-held programmable data entry terminals.

The program generator resides on a floppy disk that loads into the MSI application development system, the vendor said.

The operator keys in specific information and the generator forms a program. The vendor claimed minimal amount of technical knowledge is necessary to use the program generator.

The program generator costs approximately \$500, the vendor said from 340 Fischer Ave., Costa Mesa, Calif. 92626.



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50% OF ALL DBMS USERS CHOOSE IBM,
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But a recent benchmark
shows in performance
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CINCOM OUTPERFORMS IBM IN:

- CPU utilization 181% better
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Too often, users make a substantial investment in a data base, then find it can't support their long term performance demands. Especially for large volume, complex systems where DBMS performance is the critical factor.

The Solution? Cincom's DBMS, the only system with proven high performance—even in the most complex environments.

This is a fact proven in a recent benchmark study comparing the two dominant data bases, Series 80 TOTAL® and IBM's, which together comprise 85% of the DBMS market. While IBM's market share is larger, Cincom's TOTAL is so clearly superior in performance that it may be the only long term solution for high performance, complex environments.

The study also compares Series 80 TOTAL with the other independent data bases. And again TOTAL is vastly superior, delivering:

- CPU utilization—183% better
- Execute time—223% better
- Disk access—221% better

In short, this benchmark study dramatically confirmed what 4,000 Cincom users already know. No other DBMS measures up to Series 80 TOTAL.

CPU UTILIZATION

CINCOM 100%

IBM 181%

ALL OTHERS 183%

EXECUTE TIME

CINCOM 100%

IBM 272%

ALL OTHERS 223%

DISK ACCESS

CINCOM 100%

IBM 196%

ALL OTHERS 221%

This independent benchmark compares Cincom's DBMS with IBM's and 3 non-Cincom systems. The graph shows the average of 3 jobs combining sequential, random processing and structural maintenance using Cincom as base 100%.

SERIES 80 TOTAL: SUPERIOR IN USE.

Every day, around the world, TOTAL substantiates the findings of this benchmark study. Non-Cincom data bases point to 10-20 integrated files and 200,000 transactions per day as evidence of high performance. Compare those figures with two of TOTAL's many successful users:

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Even if you've invested heavily in a DBMS that can't support your performance demands, conversion to TOTAL could still be your wisest solution. For example:

- A major communications corporation was faced with purchasing \$5.5 million in additional equipment to support IBM DB/DC software that had reached its performance limits. By converting to Cincom, the user avoided that expense. And as a bonus, gained better performance on their existing CPU.

Doesn't it make sense to start with the DBMS you can stay with? Cincom's Series 80 TOTAL users consistently have more success and process greater volumes on larger data bases. And in today's productivity conscious environment, DBMS performance equals satisfaction.

SERIES 80 TOTAL. FROM CINCOM SYSTEMS.

For a detailed report of this benchmark study, along with more about the benefits of converting to TOTAL, contact our Marketing Services Department: 800-543-3010. In Ohio 513-661-6000. In Canada 416-279-4220.

• IDC reports August, 1980; March 1981



Cincom Systems

Cincom Systems/2300 Montana Ave. Cincinnati, OH 45211

Application Software Unveiled For TI's Business System 200

AUSTIN, Texas — Texas Instruments, Inc. has unveiled two levels of application software for its recently introduced Business System 200 line of small business computers [CW, Oct. 26].

The first level, Business System Software I, reportedly is a single-user system that automates manual accounting functions. It includes five basic accounting packages plus word processing. It is upwardly compatible with Software II.

Business System Software II is described by the vendor as a fully integrated accounting system. With Software II, an entry made into one of the five accounting applications can automatically update the

rest. It runs on Business System 200 Models 240, 250 and 251, as well as other computer systems in the vendor's DS990 family.

The accounting packages in Software I and Software II are written in Cobol and include accounts receivable, accounts payable, inventory control, general ledger and payroll.

The software is priced per package at \$500 for a Software I package and \$1,000 for each Software II package. System software for the Business System 200 starts at \$400.

TI can be reached through P.O. Box 2909, M/S 2196, Dealer Operations, Attention: H-599, Austin, Texas 78769.

Business Tools Offered For TI 900 Under DX10

HONOLULU — A family of business tools for use on Texas Instruments, Inc. 900 computers under the DX10 operating system has been developed by Info Tools, Inc.

The collection of tools, known as Biz-Pak, includes systems for financial modeling, statistical analysis, investment evaluation and several general business programs, the vendor said.

Biz-Pak software with one copy of documentation costs \$3,000 for a license fee, \$600 for each repeat package per user and \$500 for annual support from the firm, located in Suite 210, 1600 Kapiolani Blvd., Honolulu, Hawaii 96814.

Calcomp Offers Graphics Tool To Plan Facilities

ANAHEIM, Calif. — An interactive graphics software package designed to solve facilities management problems has been announced by California Computer Products, Inc. (Calcomp).

The Facilities Management package, based on the firm's IGS 400 and 500 systems, is said to let the user automate equipment layout and inventory as well as keep track of telephone lines, electrical wiring and air conditioning systems.

Priced at \$15,000, the software will be available Dec. 1 from the firm at 2411 W. La Palma Ave., Anaheim, Calif. 92801.

Service Converts Data Into Maps

PHILADELPHIA — A computer mapping service said to convert demographics and other statistics into computer-generated graphics images has been announced by Ted Barkus Co., Inc.

Geographix utilizes data bases stored in other computers, such as the 1970 U.S. census or the current regional availability of the 1980 census, and then converts demographics at the block, tract or county level into maps showing population densities by age, income, education, home ownership and other requirements.

The service has been designed for researchers, marketing divisions, data processors or others targeting a sales or advertising program to a selective audience.

Map prices depend on data bases needed to generate the maps. More information is available from Ted Barkus Co., Inc., 225 S. 15 St., Philadelphia, Pa. 19102.

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Module Tracks Costs of Projects, Tasks

NORWALK, Conn. — A new module that tracks the costs of tasks and projects as part of its project monitor system is available from TSI-International here.

The PM/Cost module runs on IBM 370, 4300 and 30 series equipment under DOS/VS(E) and OS/VS, the IBM System/34 and System/38 and on systems from Prime Computer Inc., Hewlett-Packard Co., Data General Corp. and other vendors. Its enhancement reportedly adds extended facilities for cost management and control.

Project costs can be reported in either detail or management summary formats at any of eight levels in a project breakdown, the ven-

dor said. Standard time and cost accounting reports display employee chargeable amounts as well as project costs.

Standard PM/Cost expense categories include labor, computer, travel and miscellaneous. The software also provides comprehensive scheduling and monitoring reports and charts, which are said to ensure that realistic commitments are being made, to warn of potential scheduling conflicts, track project progress and depict project status.

PM/Cost is priced at \$5,000. The project monitor system costs \$9,700, the vendor said from 50 Washington St., Norwalk, Conn. 06854.

'EIS' Data Base Version Designed for IMS/DB

DALLAS — Tres Systems, Inc. announced the availability of a data base version of its Employee Information System (EIS) for use under IBM's IMS/DB data base management system.

The EIS data base version is designed for organizations that want an IMS file structure as part of the system architecture. The base application system reportedly

provides a natural migration toward a data base structural environment.

During processing, all programs accessing the master file contain expand/contract logic to read the root segment and all available second level segments, the vendor explained, and this allows a blocked variable-length segment architecture.

EIS IMS/DB will operate with IMS/VS Level 1.15, and with DOS/VS with DOS/DL/1 interface software, and currently uses CICS as the on-line monitor. University Computing Co.'s UCC-10 data dictionary is said to be used as a standard data reference tool.

The IMS/DB data base version will be offered at an additional rate of \$40,000 over the existing license fee of \$55,000 and is available immediately. The vendor is located at 4255 LBJ Freeway, Dallas, Texas 75234.

'Emergindex' Aids Physicians

ENGLEWOOD, Colo. — Micromedex, Inc., in conjunction with the Emergency Information Center at Denver General Hospital, has announced a computer-generated emergency and critical care medical information package.

Called Emergindex, the package contains six sections that allow an acute-care physician to keep up to date with key topics in emergency medicine. Micromedex will market the package on microfiche in January. An on-line version of the index is planned, the vendor said.

The current operating environment in Denver includes an IBM 4331-2 processor with six 3278 workstations, the vendor said from 2750 S. Shoshone St., Englewood, Colo. 80110.

Book Lists Mini, Micro Software

GLENVIEW, Ill. — The Small Systems Software and Services Sourcebook, published by Information Sources, Inc., lists software for minicomputers and microcomputers.

The 500-page text details more than 1,300 available statistical programs, business applications, legal and accounting packages, report generators, program development aids, word processing programs and file managers.

A one-year subscription to The Sourcebook costs \$125. Further details are available from Ruth Koolish, Information Sources, Inc., 1807 Glenview Road, Glenview, Ill. 60025.

Color Retro-Graphics. Our Terminal Enhancements Cross Yet Another Frontier.



For over three years now, Retro-Graphics™ terminal enhancements have transformed some of today's most popular alphanumeric terminals into impressively-featured graphics terminals. Now Digital Engineering, the pioneer in graphics upgrades and creator of Retro-Graphics, has taken its successful idea and made it a colorful one as well. An idea that makes sense to the business and scientific communities alike, by making sales and financial charts, as well as complicated engineering drawings, easy to produce—and startlingly easy to afford.

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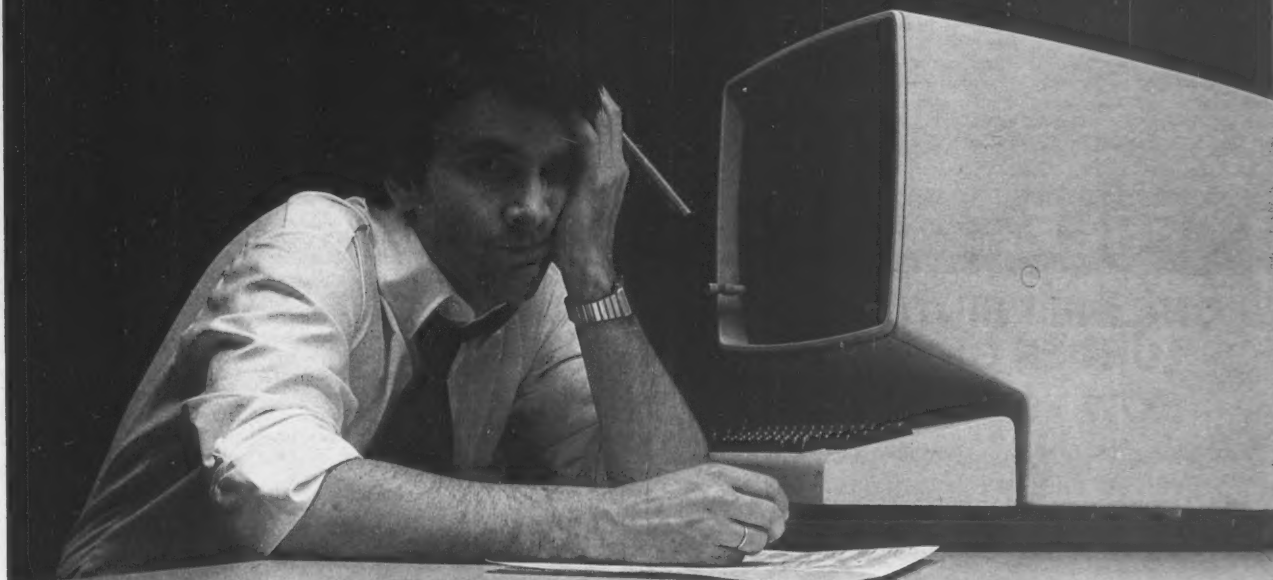
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VAM/SPF is the software breakthrough that increases programmer productivity by speeding up system response time.

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SPF is the most easily understood and widely used interactive programming tool available today. However, the high TSO overhead involved diminishes its benefits. Running SPF under VAM provides faster terminal response time, frees system resources, and translates directly into getting more work done.

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When your applications programmers take up less of the system, the systems programmers get more of TSO when they need it and total system response time improves dramatically.

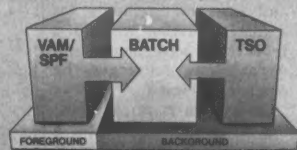
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By getting more out of your current equipment, VAM/SPF can actually improve your bottom-line operations. Because up to 35 SPF users fit into a single VAM

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VAM/SPF is the architectural solution

Boole & Babbage has taken IBM's architecture and turned it into the ideal timesharing system with the classic foreground/background approach. By forcing the SPF edit-and-submit work to



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be done under VAM as a classic foreground activity, VAM provides SPF users with truly interactive response time. Background activities such as on-line testing remain under TSO.

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VAM requires no programmer re-training and is transparent to the SPF user. And VAM is installed using standard SMP procedures.

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Release 4.3 of DASD Manager Fits OS/MFT, MVT, SVS

MARLBORO, N.J. — Release 4.3 of its Pac/Master package, a direct access storage device (DASD) management system for OS/MFT, MVT, SVS, MVS and VS1 operating systems, was announced here by CGA Software Products Group, Inc.

Features of the new release include partial release of excess space from PO/PS files based on user specifications; options that allow users more flexibility in controlling their DASD systems; and an increase in the speed of tape I/O by having PS

files written to tape in larger block size, according to the vendor.

Also included in Release 4.3 are enhancements to existing reports designed to allow more information to the user, and a new enforcement report to help determine if old standards are effective and the potential effect of proposed new standards, the vendor said.

Pricing for Release 4.3 of Pac/Master is \$11,500, the vendor said from 1370 Piccard Drive, Rockville, Md. 20850.

Three Tools For IBM Disk Available

CLIFTON, N.J. — Innovation Data Processing announced that its Fast Dump Restore (FDR), Data Set Functions (DSF), Compaktor and Automatic Backup and Recovery (ABR) utilities now are available on the IBM 3375 and 3380 disk drives.

Support initially will be available as a modification to Version 4.5 for FDR, DSF and Compaktor users upon written request, the vendor said. ABR Version 4.6, which will be available this month, will include support for IBM 3375 and 3380 disks.

The vendor also announced that its Stand-Alone Restore Version 4.5 will support the IBM 3380 disks without modification and that Version 4.6 of the product, which is available immediately, will include support for all disks including the 3375.

FDR is priced at \$4,500, including DSF; Compaktor is available for \$3,000; and the cost of ABR is \$5,000. Innovation Data Processing is located at 970 Clifton Ave., Clifton, N.J. 07013.

Candle Offers MVS Systems 'Exception Logging Facility'

LOS ANGELES — Candle Corp. announced the availability of an Exception Logging Facility (ELF) for systems running under IBM's MVS.

ELF is used in conjunction with the vendor's Omegamon and Dexas performance monitors, which operate in real-time. It reportedly detects and logs problems in the hardware and in the MVS operating system. An extended analysis facility enables users to program fur-

ther diagnostics after problem detection.

ELF is said to enable installations to document the time and date of problems such as dropped ready disks, page data set errors, lost main storage and inoperative channels.

The software product is available at no charge to installations already using both Omegamon and Dexas, the vendor said from Suite 2404, 10880 Wilshire Blvd., Los Angeles, Calif. 90024.

Firm Claims Systemacs Compatible With MADP

VALLEY FORGE, Pa. — An enhanced version of its Systemacs system life-cycle methodology was announced here by Management and Computer Services, Inc., which claimed the product is fully compatible with IBM's Management Application Development Process (MADP) study program and its Automatic Project Planning System.

The educational tools in-

clude a checklist-approach to systems development that was broadened to six phases to become the only methodology compatible with IBM's MADP, according to the vendor.

The six phases encompass requirements definition, external design, internal design, program development, system test and installation.

The enhanced version of Systemacs reportedly assists users with IBM's MADP-related training test and audio-visual aids.

The Systemacs methodology is priced at \$18,800, the vendor said from 74 Great Valley Corporate Center, Valley Forge, Pa. 19482.

HP3000 Series Receives Savings/Loan System

RICHARDSON, Texas — A complete savings and loan system, encompassing software, hardware and turnkey installation and based around the Hewlett-Packard Co. HP 3000 series of processors, has been announced by Sofco, Inc.

The system offers on-line interactive functions for savings, checking, loans, administration and regulatory and management reporting for companies with assets between \$75 million and \$750 million, the company said.

The system is also designed to handle the latest savings and loan requirements for automatic teller machines, repurchase agreements and variable rate mortgages, the company claimed.

The system is priced starting at about \$275,000 for a typically configured system or at \$125,000 for the software alone from Sofco, Inc., 500 Citizens Bank Center,

100 N. Central Expressway, Richardson, Texas 75080.

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On-Line 'GL/Plus' Enhanced, Allows Real-Time Updates

NEEDHAM HEIGHTS, Mass. — McCormack & Dodge Corp. has announced enhancements to the on-line version of its general ledger package, GL/Plus.

Version 1.2 of GL/Plus now includes on-line maintenance capability for the control file that drives the system. This will enable users to perform real-time updates.

The enhanced version also includes a real-time update feature for maintenance to the master file and real-time budgeting capabilities. This means that budgeting capabilities introduced in batch in Version 1.7 of

GL/Plus now are available in real-time mode, according to McCormack & Dodge.

In conjunction with the vendor's on-line Inquiry package, the enhanced version of GL/Plus reportedly gives users the ability to work on budget modeling, for example, check the results using Inquiry and make necessary revisions at the same session.

The enhanced features are included at no extra charge for current users of on-line GL/Plus, the vendor said from 560 Hillside Ave., Needham Heights, Mass. 02194.

MCBA Offers PDP-11 Users Cobol-Plus Accounts Packages

MONTROSE, Calif. — Mini-Computer Business Applications, Inc. (MCBA) has announced five packages in Cobol-Plus for Digital Equipment Corp. PDP-11s.

Accounts receivable, accounts payable, general ledger, order entry and payroll are said to be integratable, interactive, menu-driven and user-

friendly.

Prices for the software are \$3,000 for a single-use license; \$4,000 for a five prepaid use license (average cost \$800 per use) with \$700 royalty on the sixth and subsequent use; and \$6,000 for a 10 prepaid use license (average cost \$600 per use) with \$350 royalty for the 11th and subsequent use.

All packages carry a one-year warranty and include a user manual and system reference manual. MCBA is located at 2441 Honolulu Ave., Montrose, Calif. 91020.

PDP-11 Users Get Pascal Aid

MILWAUKEE — Aardvark Software, Inc. introduced RSTS/UCSD Pascal, which it said allows the use of UCSD Pascal on Digital Equipment Corp. PDP-11 minicomputers running under the RSTS/E OS.

RSTS/UCSD reportedly provides users with an environment for teaching Pascal, as well as for development and maintenance of application programs. It includes a Pascal compiler, assembler, screen editor, file system, linker, librarian, OS and utilities.

Featured is a user interface that the vendor said minimizes user time and system overhead.

RSTS/UCSD sells for \$995, which includes the program on magnetic tape, an implementor's guide, a user manual and a copy of the "UCSD Pascal User Manual." The vendor is located at 783 N. Water St., Milwaukee, Wis. 53202.

'Docu-Mint 3.0' Adds Eight Modules

HINSDALE, Ill. — Business Computer Design, Inc. has released Version 3.0 of its documentation package for IBM System/34 users.

Docu-Mint includes eight new modules, bringing the total number of reports available to 20. The eight modules include screen layouts report, printer spacing chart, run book creation capability and procedure flowchart.

Also included are procedure/menu cross reference, allprocs, allsource and local data area processing modules. Docu-Mint Version 3.0 costs \$700 for the first installation and \$400 for each additional installation within a corporation.

The firm is located at 15 Spinning Wheel Road, Hinsdale, Ill. 60521.

Why Packaged Software?

Make or buy?

With software development costs rising ever higher and the supply of experienced programmers becoming ever scarcer, the scales are tipping in favor of buying packaged software.

Computerworld will be publishing a Special Report on Applications Packages in January and we want to know how your installation is dealing with decisions regarding packages. Tell us about the ones you have purchased and why you selected them. Explain what motivated you to shop outside for software and how the packages are working within your organization. Have they really

proven less expensive than software developed in-house — and by how much?

Describe how much customization is required with application packages. Have they relieved some of the pressure caused by shortages of DP personnel? Enabled you to make better use of your hardware? Led to changes in equipment?

Please send your experiences and viewpoints (typed, double-spaced and no longer than six pages) by Dec. 4 to Lois Paul, Senior Writer/Software, Computerworld, P.O. Box 880, Framingham, Mass. 01701. Accompanying graphics are welcome.

Data Briefs

Unique Automation Enhances Terminal Emulation Software

IRVINE, Calif. — Unique Automation Products is offering Ezshar Version 5, an enhanced version of its terminal emulator and file transfer software product.

Ezshar now functions with Digital Equipment Corp. RSX-11, TSX-Plus and RT-11 operating systems. Improvements include higher transmission rates, self-documenting personality module generator and user-programmable function keys.

Ezshar Version 5 costs \$950 from Unique Automation at Suite L, 17922 Sky Park Circle, Irvine, Calif. 92714.

Printer Produces Graphics, Alphanumerics, Hieroglyphics

SAN FERNANDO, Calif. — Axiom Corp. has unveiled a printer that produces full-size hard-copy output directly from CRT terminals and graphics terminals.

The Model EX-1650 reproduces complex graphics, alphanumeric data in any size or font, foreign symbols or hieroglyphics.

The EX-1650 costs \$3,495 from Axiom at 1014 Griswold Ave., San Fernando, Calif. 91340.

Microprocessor Kit Upgrades Lear Siegler ADM-3 Terminals

BETHESDA, Md. — International Systems Marketing is offering a microprocessor upgrade kit for the Lear Siegler, Inc. ADM-3 and ADM-3A terminals.

The Interboard-A Kit has a 4MHz Z80 microprocessor with 64K bytes of memory and a floppy disk controller, which fits inside the terminal.

The kit costs \$795 from ISM at 5161 River Road, Building 20, Bethesda, Md. 20016.

Standard Microsystems Adds Smart CRT Terminal Board

HAUPPAUGE, N.Y. — A smart CRT terminal board said to provide the hardware and software necessary to implement a smart CRT terminal has been announced by Standard Microsystems Corp.

The Hawk 1 reportedly allows a user to configure an 80-col, 24-row display terminal by connecting a keyboard, 18.6kHz monitor and power supply to the board.

Also featuring editing capabilities, Hawk 1 costs \$425 from the firm at 35 Marcus Blvd., Hauppauge, N.Y. 11787.

DTS Applications Promise Office Productivity Hikes

By Phil Hirsch

CW Washington Bureau

Establishment of wideband all-digital local distribution systems in the nation's major cities during the next five years will permit a vast increase in office worker productivity, judging from the nine applications for these new facilities recently filed at the Federal Communications Commission [CW, Oct. 26].

GTE Telenet Communications Corp., one of the nine companies that has requested authority from the commission to operate digital termination systems (DTS) in major cities, pointed out that "as the U.S. moves toward an information-oriented economy, we believe an even greater emphasis will be placed on improving the productivity of today's 45 million white-collar workers through the use of ... workstations of various types." It specifically mentioned digital facsimile, digital PABX and slow-scan or still-frame TV teleconferencing equipment.

The basic job of the DTS will be to interconnect these facilities either directly or indirectly through interfaces with local-area networks, international and intercity networks — while also supporting communications between newer and older data terminals.

Regarding the linkage of newer devices with older devices, GTE Telenet said it is "actively exploring" the development of an interface (technically, a packet assembler/disassembler [PAD]) enabling analog facsimile machines to talk to each other as well as to digital units through the company's existing network. In most cases, Telenet now terminates at a node near the customer's site. DTS facilities will extend the network to the user's doorstep, thus providing end-to-end error and flow control while eliminating the speed constraints and signal distortions imposed by analog loops.

LDD Hardware

All of the applicants filing so far, with one exception, say they plan to use hardware manufactured by Local Digital Distribution Co. (LDD) of Rockville, Md. LDD's Rapac system consists essentially of a Digital Termination Nodal Station (DTNS) — a central microwave transceiver — which communicates through three

sectorized antennas with users up to roughly five miles away. Two microwave channels, each carrying 1.5M bit/sec,

Analysis

serve each sector. At each user's station is a roof-mounted or window-mounted send/receive antenna, 2 ft in diameter, connected by cable to the terminal interface.

National Microwave Interconnect Co. (NMIC), a newly formed company based in Atlanta, will employ DTS hardware manufactured by Nippon Electric Co. This system utilizes four sectorized antennas instead of three, plus a different modulation scheme said to be less susceptible to interference and permitting communications up to seven miles from the DTNS. Also, the NEC hardware will allow signals to be polarized, which, according to the application, will permit more users to be

(Continued on Page 100)

Paradyne Systems Manage 20 Lines

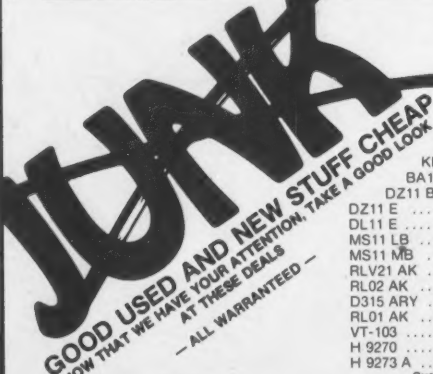
LARGO, Fla. — Two data communications network management systems designed for use with networks including up to 20 multidrop or point-to-point lines are available from Paradyne Corp.

The Analysis 4405 and 4406 systems allow central-site operators with no special training to monitor the operating status of communications lines, modems and terminals; isolate faults to any location within the network; and direct restoral action.

Major components of the systems include a CPU, CRT terminal, data storage device and printer at the central site. At remote sites, diagnostic processors are integrated with 1,200- to 16K bit/sec Paradyne modems at each terminal location.

The 4405 can manage up to 10 multidrop lines or PIX/Pixnet links including as many as 300 modems. It costs approximately \$20,000. The 4406 can manage up to 20 lines or links and 300 modems. It costs approximately \$30,000, Paradyne said from 8550 Ulmerton Road, Largo, Fla. 33541.

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Datamedia Excel 42

Datamedia Adds Two Terminals

PENNSAUKEN, N.J. — Datamedia Corp. is offering two 80- and two 132-col buffered CRT terminals that feature editing, ergonomic and reliability features.

The 80-col Excel 42 has a 12-in. screen, two-page display memory, smooth scrolling within the 48-line memory, double-wide and double-high/wide characters, blink, blank, reverse video, dual-intensity, underline and protect attributes, a vendor spokesman said.

The 80-col Excel 44 is a 14-in. version of the Excel 42. Both models feature nonglare, tiltable screens; detachable keyboard; and separate cursor control/numeric pads.

The Excel 42 costs \$995 and the Excel 44, \$1,140.

The 132-col Excel 62 has a 12-in. screen with 80- or 132-col display offering 24 lines, block mode transmission, line and character insert and delete, protected fields, visual highlighting plus double-wide and double-high/wide characters, smooth scrolling and split-screen/regional scrolling.

The 132-col, 14-in. version of the Excel 62 is the Excel 64. The Excel 62 costs \$1,895 and the Excel 64 costs \$2,040, Datamedia said from 7401 Central Highway, Pennsauken, N.J. 08109.

Modem Sends At 19.2K Bit/Sec

NEWPORT, R.I. — A synchronous wire line modem designed for transmission of digital data at up to 19.2K bit/sec over unloaded metallic circuits is available from Avanti Communications Corp.

Standard operating rates of the Avanti 1900 are 1,200-, 2,400-, 4,800-, 9,600- and 19.2K bit/sec. The output power vs. frequency conforms to Bell Publication 43401 and 41028 at speeds to 19.2K bit/sec. Operating modes are four-wire full- or half-duplex, point-to-point or multipoint.

Typical applications of the modem are data transmission between CPUs, data transmission between CPU and terminals located throughout a building or within a few miles through use of local loops and as tail modems for conventional high-speed modems, a vendor spokesman said.

The Avanti 1900 costs \$545 from Avanti at Aquidneck Industrial Park, Newport, R.I. 02840.

WY-100 Offers Split Screen



Wyse Technology WY-100

SAN JOSE, Calif. — Wyse Technology has unveiled an intelligent CRT terminal offering such ergonomic features as detached keyboard and a display console that can be adjusted according to operator preference.

The WY-100 handles horizontal and vertical split-screen operation, allowing the operator to display more than one form of data simultaneously. In each split-screen section, the terminal's editing features may be used as well, according to the vendor.

Communications capabilities standard on the terminal include 15 transmission rates from 50- to 9,600 bit/sec via a standard RS-232C or optional 20mA current-loop interface. Dialogue between terminal and host computer can occur by character or block.

The CRT terminal costs \$995 from Wyse at 726 Chacot Ave., San Jose, Calif. 95131.

Tool Lets Users Talk With Host

MARYLAND HEIGHTS, Mo. — Polygon Associates, Inc. has unveiled software that enables users of microprocessor-based business systems to communicate with a single host computer for file storage, information access and peripheral sharing.

In order to be software-compatible these systems must be running under Digital Research, Inc.'s CP/M, Digital Equipment Corp.'s RT-11 or engineering/development systems (Intel Corp.'s MDS, Motorola, Inc.'s Exorciser).

The Poly-XFR will support DEC PDP-11s running RSX-11M or RSTS/E as a host, with support for DEC's VAX/VMS and Bell Laboratories' Unix to be announced shortly, the vendor said.

Poly-XFR supports both binary and Ascii file structures, allowing software to be loaded from a central support site. The system will work on asynchronous lines, remotely via modem or in a direct wire-environment at speeds to 9,600 bit/sec, according to the vendor.

Poly-XFR is priced at \$585/host processor and from \$50 to \$250/local processor, depending on quantity, Polygon said from 9 American Industrial Drive, Maryland Heights, Mo. 63043.



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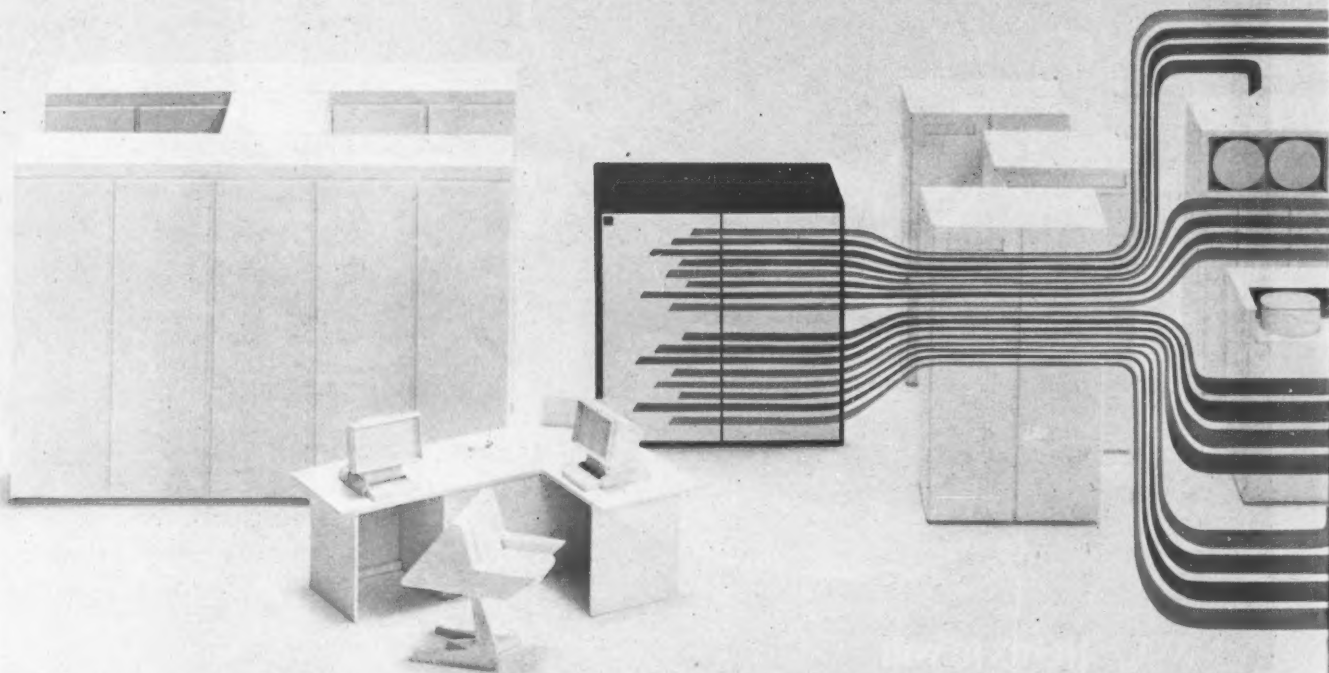
Thank you, Quadronix, from all of us at Wabash and your thousands of customers... you've done us proud!

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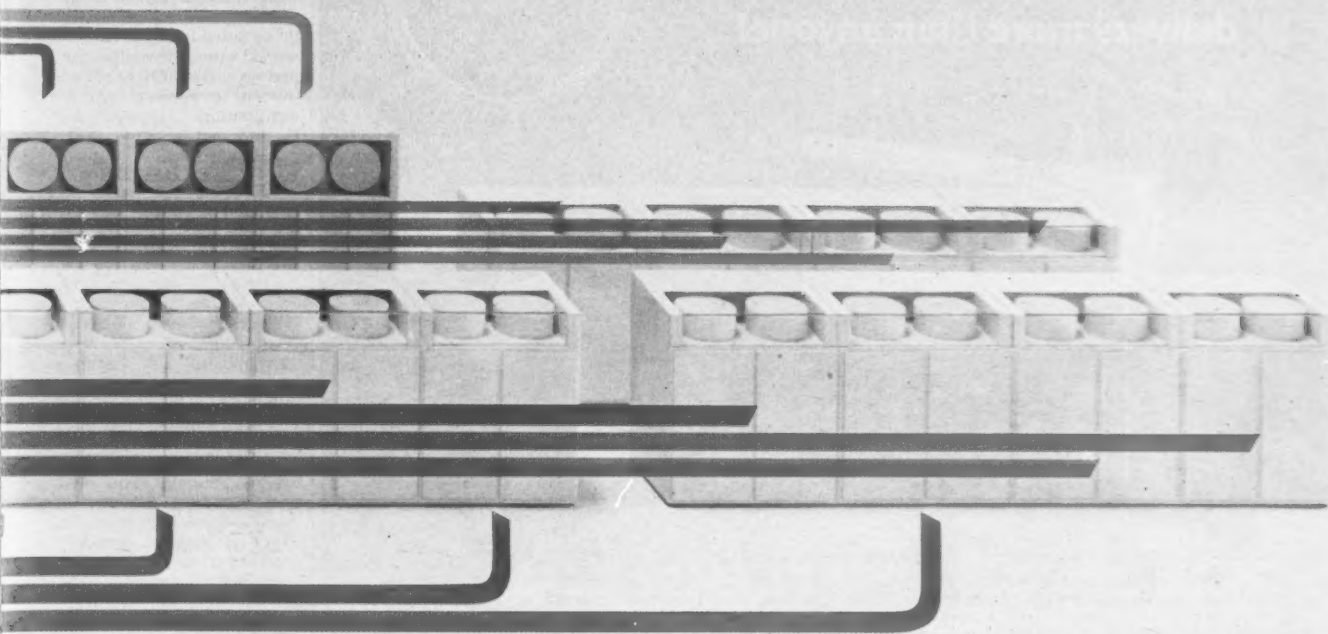
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System Adds Data Channel to PABXs

KIRKLAND, Wash. — A system designed to assist installation of individual or multiple computer terminals is available from Teltone Corp.

The DCS-2 adds a data channel to virtually every private automatic branch exchange (PABX) telephone system for simultaneous voice and data communications on local telephone pairs. Terminals can be placed wherever a telephone is located.

The dedicated, full-duplex, asynchronous data links run at speeds to 9,600 bit/sec. The range of the system is limited to

about 5,000 cable ft between the telephone site and PABX interface point.

If a distance between a PABX wire center and a computer room exceeds several hundred feet, a DSC-2A system with integral multiplexers may be used that concentrate 32 channels over a telephone company T1 digital carrier or a private four-wire circuit.

A complete Mini-File starter system costs about \$1,500. A complete 8-channel system costs approximately \$474 per channel, Teltone said from P.O. Box 657, 120th Ave. N.E., Kirkland, Wash. 98033.

Applicants Claim DTS Will Increase Productivity

(Continued from Page 95)
accommodated within the allocated frequency band.

The big innovation mentioned by NMIC, however, is full-motion color TV teleconferencing at 1.5M bit/sec. By comparison, the standard bit rate for commercial color TV programs is 64M bit/sec. NMI's system is based on technology developed by Nippon Electric, which re-

duces the standard video bit stream to one-fortieth its original size.

On-line composition and typesetting were two of the applications discussed by Tymnet, Inc.

"A particularly high data volume phase of the document publication cycle is the transfer of the photocomposition data file for production of camera-ready copy. Because of the large volume of data involved and the prohibitively lengthy and expensive communications task required to transfer the data at 9.6K bit/sec — that is, over a telephone line — magnetic tapes today are sent physically from a computer center to the customer's photocomposition device or service bureau. Wideband, low bit error rate communications channels in the range of 56K bit/sec to 256K bit/sec [to be provided by DTS networks] would streamline the process sufficiently to attract the fast turnaround photocomposition applications, the firm said.

Unit Performs Text Editing

TEWKSBURY, Mass. — Visual Technology, Inc. has unveiled a CRT terminal that acts as a multipaged text editing terminal or a buffered editing terminal.

The Visual 300 features block and character transmission; 12 user-programmable non-volatile function keys capable of storing 32 codes each; blink, underline, reverse, bold and blank video attributes requiring no display space; up to eight pages of display memory; and split screen.

Ergonomic features include a setup mode that eliminates all cumbersome miniature switches. Terminal parameters are also presented on the screen in a menu-style format.

The Visual 300 costs \$1,150 from Visual Technology at 540 Main St., Tewksbury, Mass. 01876.

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- 3 OEM Triple Modem Cards:** Racal-Vadic is designing integrated full duplex 1200 bps modems on compact PC cards for major terminal manufacturers per their packaging and performance specifications.

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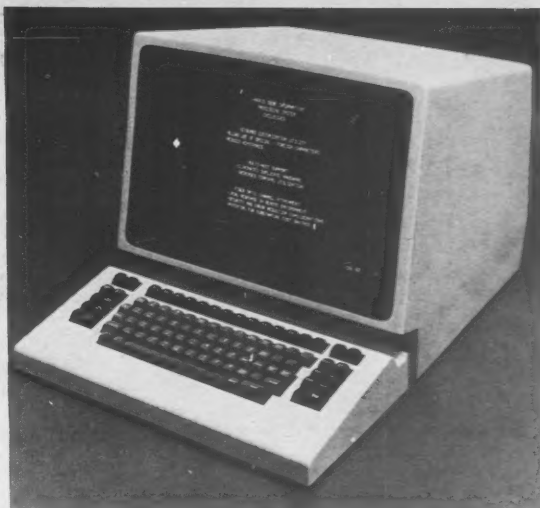
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that makes us take our 100% unit testing and fast-response service capabilities so seriously. Our customers feel the same way. From our first Model 3311 to our new smart Model 100, Teleray customers have kept coming back for more. And we don't plan on letting them down.

Our new Model 100 has all the same features that made the old 100 so versatile—standard features,

not expensive add-ons. Features like a full 3,168 character display, 18.6 kHz high resolution CRT, 256 character buffer, auto repeat, bi-directional printer port, screen saver, and non-volatile programmable memory for 20 separate user functions. Its smooth scroll can be programmed for 5, 10, 15, or 20 lines per second. Its four character widths let you program 40, 66, 80, or 132 columns. Its snap-in modules keep servicing fast and easy. And it's both VT100 and VT132 compatible, of course.

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100 Times Faster Than Software GE Unveils Hardware Search System

VIENNA, Va. — A hardware-based, high-speed search and retrieval system that reportedly scans and accesses data more than 100 times faster than software-oriented inverted or sequential systems has been introduced by General Electric Co.

The Gescan 2 retrieval system uses a minicomputer-based text array processor to scan information at speeds in excess of 2M char./sec, a spokesman claimed.

Basically, the system — which is billed as an alternative to software-oriented data base management systems (DBMS) — allows information to be stored word-for-word and without the indices, keyword lists or abstracts. When a user wants to search for information within the data base, a query is entered and compared with the stored data. The data base infor-

mation is compared and matched with the user query through a string pattern matching algorithm implemented within each of the system's processors.

Since the system does not use any kind of index or search/support materials — which in many cases require more storage than the actual data base — information is added to the end of the user's file.

Basic Hardware

The basic system hardware consists of a minicomputer with 128K bytes of memory, two 10M-byte cartridge disk drives, an 80M-byte disk drive, a nine-track magnetic tape drive; the search hardware, a 180 char./sec printer and a user terminal.

The heart of the stand-alone Gescan 2 is a text array processor developed by GE that pro-



GE's Gescan 2 Retrieval System

vides a full search of an entire data base whenever a query is

entered. The processor, which is based on large-scale integration technology, permits independent parallel processing of queries and search of the system's data base. However, unlike existing software-based DBMS, the GE system does this full-text search without a host processor or extensive programming, the spokesman continued.

To accommodate more than one user query, the system's processors can be linked together to form an array and operate simultaneously and independently of one another, the spokesman said.

Typical applications include automated message handling, digital pattern recognition, scientific and technical publications retrieval, patent search and news service research, the spokesman stated.

The basic Gescan 2, including documentation, software, installation and user training, costs \$249,750 with delivery in 90 days from the firm at 1755 Jefferson Davis Highway, Arlington, Va. 22202.

For Less Than \$100,000

McAuto Adds Desktop CAD/CAM

ST. LOUIS — A fully integrated computer-aided design and manufacturing (CAD/CAM) system for less than \$100,000 has been announced by Mc-

Donnell Douglas Automation Co. (McAuto).

The Unigraphics ADS-100 features a single graphics terminal and minicomputer packaged

into an L-shaped desktop workstation. Hardware is driven by McAuto's Unigraphics software, said to provide interactive three-dimensional design, drafting and preparation of numerical control machining tapes from a common data base.

Standard system hardware includes a bit word computer with 128,000 char. of memory and McAuto-developed operating system, a 25M-char. fixed disk, a removable 1.2M-char. floppy disk, a 32-button graphics function keyboard and an alphanumeric CRT terminal.

The user can choose among storage tube, monochrome raster tube or color raster tube for graphics display, according to the vendor. Base price for the system is \$90,000 from the firm in St. Louis, Mo. 63166.



The Unigraphics ADS-100

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We make five basic models to provide up to eight switchable interfaces each of which can be logically connected to as many as eight CPUs.

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Part of Tektronix 4110 Line

Color Graphics Terminal Unveiled

BEAVERTON, Ore. — Tektronix, Inc. today expanded its 4110 series line of intelligent graphics terminals by introducing the series' first color model, aimed at the computer-aided design and mapping markets.

The Model 4113 is a medium-resolution graphics display that is said to incorporate pseudo high-resolution capabilities. The system contains a 60Hz noninterlaced raster scan display that is presented on a 19-in. viewing screen. Images have 4,096 by 4,096 points of addressability, viewable in 640 by 480 blocks, a spokeswoman explained.

Features of the system include up to 1M byte of internal memory; com-

munications speeds with the host computer up to 9,600 bit/sec; a local zoom and pan capability; and, like other models in the 4110 series, the ability to locally retain picture segments.

This last capability allows users to define pictures and picture elements, store them locally and recall and manipulate them with transmission of a segment identifier from the host system, the spokeswoman noted.

In its basic three-bit configuration, the 4113 offers eight colors. However, by adding an optional bit plane, as many as 16 colors can be displayed at the same time. By varying lightness, saturation and hue, up to 4,096

colors can be displayed, each one standardized under a previously developed Tektronix Color Standard.

Optional equipment includes a three-port RS-232C peripheral interface that enables local control of Tektronix devices, such as the 4662 and 4663 interactive digital plotters, the firm's 4641 and 4642 printers and its hard-copy units and graphics tablets. In addition, the 4113 offers optional mass storage via one or two integral flexible disks.

The base price of the stand-alone 4113 is \$16,500, or \$3,500 for the desktop package, the spokeswoman said. The firm can be reached at P.O. Box 500, Beaverton, Ore. 97077.

Process Restores STC Tape Heads

VALENCIA, Calif. — Magnetic Recovery Technologists, Inc. has announced a process to recondition Storage Technology Corp. tri-density (6,250-, 1,600- or 800 bit/in.) tape heads.

The firm said its reconditioning process yields tape heads that last as long as new heads. The process includes rebuilding, replating, recontour, alignment and recharacterization of the read amplifier and resistor pack, the vendor said.

Tape head reconditioning costs between \$215 and \$555.

Magnetic Recovery Technologists is based at 25431 Rye Canyon Road, Valencia, Calif. 91355.

Graphics System Turns Output Into Slides

MINNEAPOLIS — A high-resolution color raster graphics system utilizing computer output to film technology for the creation of 35mm slides and business graphics has been introduced by Dicomed Corp.

The Dicomedia Slidesystem is composed of the Dicomed D38 remote design station, the Dicomed D148S color slide system, a Dicomed D48S color raster recorder, Digital Equipment Corp.'s PDP 11 computer and finally Dicomedia II production software.

The D38 design station allows the user to produce slides, charts, graphs, maps and other graphics in up to 64 different colors. All commands are written in English, enabling non-technical personnel to use it.

Slide production is accomplished on the Dicomed D148S color slide system, which processes slide data stored on floppy disks. The Dicomed D48S color raster recorder can produce a color 35mm slide in 90 sec.

Optional optical assemblies for 16mm cine format, 35mm cine format and 84mm adapter lens to accommodate 4-in. by 5-in. cut film are available. Other accessories include the B402 digitizing tablet, which enables the operator to duplicate existing artwork or photography, and the B403 black and white hard-copy unit, which records on paper any graphics generated on the CRT screen.

The design station costs \$59,900. Further information is available from the vendor at 9700 Newton Ave. S., Minneapolis, Minn. 55431.



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New VISUAL 300.
Now let's compare flexibility and price.

Before you buy one more video terminal compare the new VISUAL 300.

The microprocessor-based VISUAL 300 combines a highly comprehensive command set with traditional VISUAL ergonomic design. The result is a terminal built for flexibility and superior productivity. And at surprisingly low prices.

Of the terminals in its class only VISUAL 300 offers so many standard features including:

- Flexible block mode transmission parameters
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- Split screen
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Call for full details on the VISUAL 300... the new standard of comparison for video terminals.

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	VISUAL 300	TeleVideo 950
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Solid State Keyboard	STD	NO
Programmable Non-Volatile Function Keys	STD	NO
Video Attributes Require No Display Space	STD	NO
Non Glare Screen	STD	STD
Smooth Scroll, Slow Scroll and Jump Scroll	STD	NO
Audible Key Click	STD	STD
Non Volatile Set-up Modes, "Menu" Style	STD	NO
25 Status Line	STD	STD
Split Screen	STD	STD
Line Drawing Character Set	STD	STD
Block Graphics	STD	NO
Sculptured Keycaps, Matted for Low Glare	STD	NO
Paging	OPT-B Pres.	OPT-A Pres.
Full Editing	STD	STD
Programmable Non Volatile Columnar Tabbing	STD	NO
Choice of Typomatic/Non Typomatic Keyboard	STD	NO
14" Screen	OPT	NO
Independent Xmit/Receive Rates	OPT	NO
N-Key Rollover	STD	NO
CR New Line Mode	STD	NO
Foreign Character Sets	OPT	NO
User Programmable Non-Volatile Answerback, 32 Codes	STD	NO
Screen Brightness Control from Keyboard	STD	NO
XON/XOFF Flow Control, Split for Xmitter and Receiver	STD	NO



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*VT125. For affordable
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If you're among the thousands of users who believe that no terminal is quite as good as the VT100 in terms of power, performance and reliability, then we've got good news for you.

We've taken all that's been admired in VT100 technology and spread it throughout a family of terminals.

So now we can offer you VT100 technology in a variety of prices. With a variety of performance features. With flexible video options. For end-users. For OEMs. And for people with precise business requirements.

In short, we've created a VT100 family.

Affordable business graphics. The VT125 graphics terminal.

You might look at it as a VT100 with graphics. Or you might look at it as the first really affordable graphics terminal.

But what *truly* makes it unique, though, is a new graphics instruction set called ReGIS. (Remote Graphics Instruction Set.)

With simple but powerful commands, you can use ReGIS to turn numbers into instantly understandable pie diagrams, charts, bar graphs and curves with minimal demand on your CPU.

The VT125 also writes text as well as it draws pictures, so what graphics fail to say, words can.

The VT125 will work on any system that supports asynchronous ASCII terminals. As do all the terminals in the VT100 family.

This one, for instance:

A new economy terminal. VT101.

It has all the well known features of the VT100. But unlike the VT100, it was designed for people who don't foresee a

time when they'll need the VT100 options or its space and power to expand.

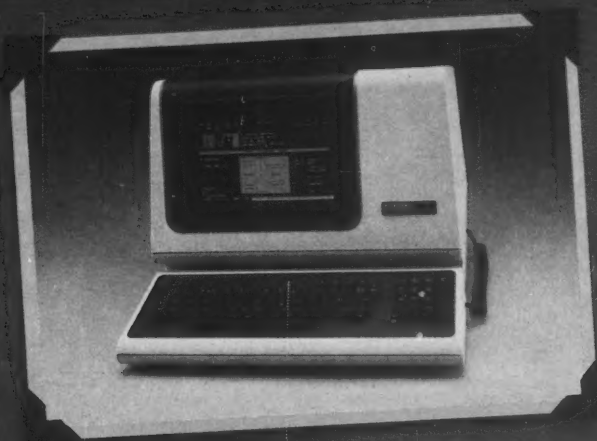
The VT101 can display 80 or 132 column lines of data with smooth scroll. You can select double-height and double-width characters. And since its functions can all be personalized from the keyboard, you'll feel very comfortable working with it.

So if you need a terminal that's as good as a VT100 without the expandability of the VT100, this is it. On the other hand . . .

The VT102 might be all the terminal you'll ever need.

As standard equipment it has the most popular options available on the VT100. But like the VT101, it doesn't have the room and power for expansion.

You get an advanced video package which includes blinking characters, un-



*VT132. Smart.
Block mode. Expandable.*



*VT131. Fully featured.
Smart. For block mode.*



VT100. The standard.

on the idea that nothing works like a VT100.

derlining and a full 24 lines of 132 column characters. The package lets you maximize Digital's forms handling and editing software for increased productivity. It also has a printer port and five full and half duplex protocols so you can use a wide variety of modems.

The VT102 has a counterpart called the VT131. It's the block mode version for use on any asynchronous ASCII system.

Then there's the VT100 itself.

The most popular video terminal ever built.

The VT100 (and the VT132 for block mode transmission) have enough power and room to support any kind of expanded capability you might need. This way, they're perfect for OEMs developing demanding applications, or for end-users who'll need the power for added options later on.

The VT100 will accept our plug-in graphics board, and thus can become a graphics terminal . . . VT125. (Maybe you ought to look into that, especially if you already own a VT100.)

Most people will tell you the VT100 is a great terminal. But if you want a little more or a little less, it's nice to know there's a family to pick from. Want to find out more? Contact your local Digital terminals dealer or sales representative today. Or for more information, contact **Digital Equipment Corporation**, PK3-2/M94, Maynard, MA 01754 Tel. toll-free 800-225-9378 (outside the Continental U.S. and in Massachusetts call 617-467-7068) between 8:30am and 5:00pm Eastern time. In Europe: Digital Equipment Corporation International, 12 Av. des Morgines, CH-1213 Petit-Lancy/Geneva. In Canada: Digital Equipment of Canada, Ltd.

Hard copies from your terminals?

For hard copies of what appears on the screen of your VT100 family terminal, you can choose from the DECprinter III for exceptional throughput, or the versatile DECwriter IV if your applications include graphics. One is probably perfect for you. Your dealer or sales representative can help you decide.

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people work.**



'The System Went Down, Then ... Wham, Smedly Went Down.'

Bits & Pieces

Color Graphics Unit Gets Bubble Memory

WESTERVILLE, Ohio — Industrial Data Terminals Corp. has announced a bubble memory enhancement for its IDT-2200 color graphics terminal.

The nonvolatile memory allows 1M- or 2M bits of storage and is capable of saving a library of pictures and sub-

pictures, the vendor said.

The basic IDT-2200 costs \$11,495. A 1M-bit bubble memory costs \$3,500; a 2M-bit bubble memory costs \$4,900, the vendor said from 173 Heatherdown Drive, Westerville, Ohio 43081.

Mannesmann Tally Cuts Printer Prices

SEATTLE — Mannesmann

Tally, Inc. has reduced prices by as much as 15% to 20% on several of its matrix and serial printers.

The MT-1800 dual mode, high-speed printer now costs \$1,995, down from \$2,495, a 20% reduction.

Prices were reduced by over 15% on the firm's MT-1600 and MT-1700 serial printers. The MT-1700 standard configuration printer was reduced from \$1,995 to \$1,695 and the MT-1600 options adaptable unit was reduced from \$2,095 to \$1,695.

The MT-1000 series printers have also been upgraded to 200 char./sec and feature optimized bidirectional printing and high-speed slew to achieve throughput speeds up to 250 line/min. Print speed for the MT-1800 dual-purpose printer in its letter-quality correspondence mode is reduced to 50 char./sec due to the 40 by 18 char. dot array it employs, according to the firm, which can be reached at 8301 S. 180th St., Kent, Wash. 98031.

Matrix Printer Gets Option Package

CHARLOTTE, N.C. — Datasouth Computer Corp. has announced a package of options for its DS180 matrix printer, including graphics, compressed print, display mode and expanded buffer.

The dot-addressable raster-scan graphics feature allows the user to print computer-generated charts and other pictorial images and the compressed print allows for variable horizontal pitch selection, the vendor said.

The option package for the DS180 printer is priced at \$150 from Datasouth Computer Corp., 4740-A Dwight Evans Road, Charlotte, N.C. 28210.

Minicomputer TOTAL The DBMS that fits DEC hardware better than DEC software.

Companies building sophisticated application systems with PDP-11 or VAX face limitations with DEC-supplied software. RMS-11 lacks the capability of data reliability. And DBMS-11, with its excessive overhead requirements, is much too cumbersome. Only one DBMS offers the unique combination of features that DEC users need. Minicomputer TOTAL.

Only Minicomputer TOTAL combines powerful data structures, low overhead, ease of use and portability. And in conjunction with T-ASK, our data base oriented, interactive query facility, Minicomputer TOTAL provides the flexibility that an integrated information system requires.

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TI Spawns 'Third-Generation' Micros

DALLAS — Texas Instruments, Inc. has announced a series of what it terms "third-generation" 16-bit microprocessors, one of which is reportedly the first to incorporate floating-point instructions.

The TMS99105 and the TMS99110 are based on n-channel silicon-gate technology and are said to have operating speeds twice that of current 16-bit offerings. The chips feature a high-speed on-chip memory that can be addressed independently of main memory, a TI spokesman said.

Called Macrostore, the memory consists of both read-only memory (ROM) and

random-access memory (RAM). It is a storehouse for frequently used functions that are emulated in a portion of memory other than the main address space.

The chips also offer a 167 nsec memory cycle time, geared for use with cache memories, and a Control ROM (Crom) with a microcoded instruction set that manages the CPU. The Crom interprets assembly language instructions using a 152-bit-wide microcoded control word — twice the length of any other 16-bit microprocessor presently on the market, the spokesman claimed.

The TMS99105 is a base-line MPU that provides a bridge between previous-generation

TMS9900 computers and has an address space of 256K bytes of main memory and 120K bytes of Macrostore memory. It has 82 instructions which are supersets of TI's 9995 and 9900 instruction set.

The more powerful TMS99110 — intended for high numerical precision and computation-intensive applications — has virtually the same capabilities, but includes 11 single-precision floating-point instructions resident on its Macrostore memory. The floating point instructions include load real, store real and convert extended integer to real, the spokesman noted.

Shasta Bases DP/WP Units on Xerox 820

SUNNYVALE, Calif. — Shasta General Systems, Inc. has announced the Parrot line of data and word processing business systems based on the Xerox Corp. 820 microprocessor.

Shasta introduced two word processing packages, WP One and WP Two, for the systems as well as several data processing packages. The firm also announced enhanced peripherals for the system including 5¼-in. 2M-byte and 1.4M-byte floppy disk drives, a 5.7M-byte Win-

chester disk drive and a line of matrix and fully formed character printers, according to the vendor.

In addition, Shasta said its Parrot systems will support applications programs from outside vendors, such as Sorcim, Inc.'s Supercalc.

The basic Xerox 820 includes a 24 by 80 char. black-and-white display screen, an adjustable alphanumeric keyboard and a 5¼-in. or 8-in. floppy disk drive, according to the vendor.

Word processing features include autoword wrap around, automatic margin adjustments, justified printouts and a block move/copy capability. Com-

mand modes include print document, shadow print, global search/replace and insert and recall text features, according to the vendor.

Available function keys include bold print, double underlining, superscripts and left-margin indentation, according to the vendor.

Higher level word processing features include an office filing system, document merge and document assembly. Data processing software includes time accounting, time and expense reporting and productivity analysis capabilities, according to Shasta.

The firm said the systems are

aimed at retail, manufacturing, wholesaling and accounting markets. They can also be used by attorneys, architects, physicians and dentists. The firm added that it has specialized software available.

Systems are available through Shasta's retail outlets, independent dealers and OEMs, according to the vendor.

Systems cost from \$5,000 depending on selected software and peripherals. The firm also markets Xerox 3000, 3100 and 3200 series systems. The Parrot line can be an upgrade from those systems, the vendor said from 1329 Moffett Park Drive, Sunnyvale, Calif. 94086.

Symcro Adds Larger Model Of Easy Grow

PENNSAUKEN, N.J. — Symcro Systems, Inc. has announced a larger model of its SB700 Easy Grow microcomputer that offers doubled disk storage and a 26% lower purchase price.

Called the SB700-B, the CP/M-based system can be used in a multiuser environment serving up to 200 independent users simultaneously. Users can share a central processor pool and data base, the vendor said.

The processor features a 20M-byte 8-in. Winchester disk in place of the 10M-byte drive used in the original SB700. The SB700-B can house up to six disk drives or 120M bytes of disk storage as compared to the previous maximum of 20M bytes. Total capacity for an SB700-B, including disk controllers is 600M bytes, up from 300M bytes on earlier models, the vendor said.

The Z80-based system's purchase price has been cut 26%, largely as a result of lower cost disk drives, the vendor said. A four-module processor with 20M bytes of disk storage and a 1M-byte diskette now costs \$15,115. An equivalent older system would cost \$20,470. A two-user system including two keyboard/display workstations and a 150 char./sec printer costs \$19,210 and an eight-user system costs \$37,020, the vendor said from 7300 Crescent Blvd., Pennsauken, N.J. 08110.

Dual-Purpose Printer Runs on System/34, 38

TUSTIN, Calif. — General Business Technology, Inc. has announced the GBT 5203DP, a dual-purpose printer for IBM System/34 and System/38.

The printer features a 250 line/min print speed in a standard mode and 50 char./sec in a letter-quality mode. Selectable print density provides 132 char./line at 10 char./in. or 198 char./line at 16.5 char./in.

Under operator or host control users can print a 132-column format on an 8½-by 11-in. paper.

The printer costs \$5,295, the vendor said from Suite A, 2630 Walnut Ave., Tustin, Calif. 92680.

NEC Unveils Memory, Single-Board Processor

NATICK, Mass. — NEC Electronics U.S.A., Inc. has announced a single-board processor and a memory board that features up to 256K bytes of random-access memory.

The BP-0186 is an Intel Corp. Multibus-compatible processor based on NEC's UPD8086 16-bit microprocessor.

On-board memory consists of 32K bytes of programmable read-only memory or read-only memory and main memory can be expanded to 1M byte. A serial RS-232C

Mini Bits

synchronous interface with software-selectable transmission rates and 24 buffered, programmable, parallel I/O lines is included, the vendor said. The unit costs \$2,100, according to the vendor.

Also announced was the BP-0300, a Multibus-compatible memory board that is available with 128K- or 256K bytes of memory. The 128K-byte version costs \$2,400 and the 256K-byte version costs \$3,200, the vendor said from One Natick Executive Park, Natick, Mass. 01760.

Line Voltage Detector Protects Against Spikes

PLAINVIEW, N.Y. — A line voltage detector designed to protect computers, word processors, data communications equipment and other microprocessor-controlled instruments from voltage spikes has been announced by Pilgrim Electric Co.

The Voltector Series 6 protects against 500A surges having 10-msec rise times and 1,000-msec half-amplitude decay times, representative of induced lightning effects.

It also attenuates radio frequency interference between 1MHz and 1,000MHz in both the common and transverse modes by more than 60db.

With five models available from 1A to 10A, the Voltector Series 6 is priced from \$79.50 to \$119.50 from Pilgrim Electric Co., 29 Cain Drive, Plainview, N.Y. 11803.

Single-Board Micro Handles Math Functions

DALLAS — A single-board CPU featuring an Intel Corp. 8086-8087 chip set giving the computer a large capability in processing math functions, including transcendental function, has been announced by Hardy Computer Corp.

Advanced communications capabilities are provided in the Model 8001 by an Intel 8274 protocol controller, which provides two channels of serial data communications that can be programmed to be either asynchronous or synchronous.

On-board memory consists of up to 128K bytes of random-access memory and 16K bytes of programmable read-only memory, while a two-bus structure permits multiple processors to be put on the same multibus.

The basic MPU with two RS-232 interfaces is priced at \$1,975 or at \$12,000 when configured with an additional 1M byte of memory, a 40M-byte Winchester disk drive and a 20M-byte tape streamer from Hardy Computer Corp., 11430 Denton Drive, Dallas, Texas 75229.

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Net Flexibility, Storage, I/O Increased on Syfa 50

IRVINE, Calif. — Computer Automation, Inc. has announced increased storage capacity, enhanced network flexibility and extended I/O options on its Syfa 50 line of distributed processing systems.

The unit's flexible diskette storage has been expanded from 250K bytes to 1M byte. A second 1M-byte diskette drive can be added for more on-line storage. The disk drive costs \$1,475, the vendor said.

The firm also announced users can replace the standard asynchronous

communications feature with an IBM 3780 bisynchronous communications feature. The asynchronous feature costs \$550 and the bisynchronous feature costs \$1,800, the vendor said.

Syfa 50 users can now attach a second RS-232 CRT terminal, a feature that allows the system to support two concurrent users. Users can also opt to attach a serial printer instead of a second CRT terminal, the vendor said.

The firm is located at 2181 Dupont Drive, Irvine, Calif. 92713.

MSD Xenix-Based Workstation Said to Provide Full Unix Power

GRAND RAPIDS, Mich. — MSD Corp. has announced the MSD 23/256, a Xenix-based workstation that reportedly provides full Unix power.

Configured for four users, the unit is designed for software production. The MSD 23/256 uses a Digital Equipment Corp. PDP 11/23 processor with 256K bytes of main memory. In addition, an 8-in. floppy disk subsystem, a 20M-byte Winchester disk drive with an integrated cartridge tape backup, one DEC VT100 CRT

terminal, one DEC LA38 tractor feed printing terminal, an autodial 300 bit/sec modem and a four-user binary Xenix license.

The Xenix operating system supports Fortran and compilers as well as other features including text processing and system accounting, the vendor said.

The system costs \$23,256, the vendor said from Suite 300, 2449 Camelot Court, S.E., Grand Rapids, Mich. 49506.

Data Collection System Uses Bar Code Readers on Series/1

WAKEFIELD, Mass. — A data collection system using bar code readers on the IBM Series/1 minicomputer has been announced by Wakefield Software Systems, Inc.

In the WSSI/Wand 2S general-purpose system, bar code readers may be used to read data on continuous forms, documents, badges, labels, tags or cards. The transaction-based system reportedly features up to 99,999 user-definable transaction types. Display prompts will indicate

whether the action and action sequence are correct.

Wand 2S runs on the IBM Series/1 under the EDX and PXS operating systems. The system requires a minimum of 96K bytes of main memory, a 2.4M-byte diskette and an operator console, selling for \$16,220. The software costs \$3,600, shipped on diskette with operations manual. Monthly lease/purchase agreements are available from the firm at 28D Vernon St., Wakefield, Mass. 01880.

Okidata Offers IEEE Bus Adapter

MOUNT LAUREL, N.J. — Okidata Corp. has announced an IEEE 488 bus adapter and a current-loop interface for its line of dot matrix printers.

The bus adapter will make all new and existing Microline printers compatible with Commodore, Inc.'s Pet personal computers. The adapter can be used on the firm's Microline 82A, 83A and 84 models. The firm also an-

nounced an optional Microline RS-232C high-speed serial interface that will add a current loop interface as a standard feature, the vendor said.

The interface comes as a plug-in board and with either a 2K-byte memory or a 256-char. storage buffer and costs \$110, the vendor said from 111 Gaither Drive, Mount Laurel, N.J. 08054.

Apple II Upgrade Module Out

TUSTIN, Calif. — An enhancement module for the Apple Computer, Inc. Apple II microcomputer said to enable users to display information in an 80-char. format has been announced by Wespacorp.

The Wizard-80 is designed to be embedded into the host computer,

which cannot display more than 40 characters of data per line at one time, even though users can input up to 80 char./line, according to a company spokesman.

The Wizard-80 is priced at \$345 from Wespacorp, 14321 New Myford Road, Tustin, Calif. 92680.

Handbook Bows for Reality Users

IRVINE, Calif. — JES & Associates has announced a handbook for users of the Microdata Corp. Reality Computer system.

The handbook covers all syntax requirements for commands in both

the 3.X and 4.X releases of the Microdata operating system.

The handbook costs \$50 plus \$2.50 for postage and handling. The vendor can be reached through P.O. Box 19274, Irvine, Calif. 92713.



How Fast Can A RAM Run?

Mighty Micro, the symbol of Digital Equipment Corp.'s 16-bit microcomputer, did its bit recently for charity and physical fitness by joining about 16,000 other runners in the New York Marathon. The micro reportedly ran the 26-mile race in just under four hours. Rather than doing it just for the memory, however, Mighty Micro participated in the race because its sponsors chipped in \$653 to a charity with a goal of ending world hunger.

National Semi, Wang Ink Pact

SANTA CLARA, Calif. — National Semiconductor Corp. and Wang Laboratories, Inc. have signed a long-term technology transfer agreement under which National Semi will provide Wang with licenses and periodic updating of its Xmos manufacturing process. The agreement will allow Wang to develop custom large-scale integrated circuits for its own products.

The Xmos process is a high-density, high-speed, in-channel silicon technology used in the production of National Semi's NS 16000 16-bit microprocessors.

Wang's custom chips will be manufactured at the firm's new technology center in Lowell, Mass. National Semi can provide volume production for Wang's custom circuits.

R&D Limited Partnerships Emerging in Silicon Valley As Venture Capital Alternative

By Robert Batt

CW West Coast Bureau

PALO ALTO, Calif. — New enterprises in California's Silicon Valley are turning to new ways of funding their businesses.

One of the latest funding techniques — research and development limited partnerships — is beginning to emerge as an alternative for companies reluctant to entrust themselves entirely to venture capitalists, until now the traditional way of acquiring start-up capital. The pioneer in this alternative was Storage Technology Corp. (STC), which used the capital to develop a large mainframe computer. STC was soon followed by Trilogy Systems Corp., — Gene Amdahl's new venture — which needed money for similar purposes.

But now, as R&D partnerships become more familiar, smaller enterprises dealing in peripheral areas are also beginning to take advantage of these new schemes to raise finance. One of the first to do so was Western Business Computers, Inc. (WBC), a San Jose-based firm that acts as a software distributor.

Although shares in WBC's limited partnerships have not been marketed on the scale of those for STC and Trilogy, they do conform to California's securities regulations, according to Terry March, president of WBC.

Two WBC Partnerships

To date, WBC has put together two \$2.5 million limited partnerships and will conclude two others for a total of \$3 million by the end of the year.

The funds have been employed to develop software products that make application software for Basic Four and Data General Corp. machines compatible with Honeywell, Inc.'s operating system.

This is how the WBC operation works. A limited partnership, usually consisting of high-salaried industry executives, funds an R&D company (in this case called BST) to develop software products.

Once the R&D company completes the

development, it hands the technology back to the partnership. The limited partners then license the technology to WBC on a royalty basis — that is, every time WBC sells a computer that uses the technology, it pays a royalty to the limited partnership.

When the partners have accrued an
(Continued on Page 116)

Trilogy, STC Blaze Trail

By Robert Batt

CW West Coast Bureau

Two companies that have pioneered the use of research and development (R&D) limited partnerships in the data processing field are Trilogy Systems Corp. and Storage Technology Corp. (STC).

Following his experience at Amdahl Corp., where much of the company's ownership went to outside investors, Gene Amdahl, founder of Trilogy, was keen to avoid the pitfalls inherent in traditional venture capital financing. Indeed, some industry sources claim Amdahl's departure from the company that bears his name was motivated by the fact that, after doing so much of the work himself, the rewards were being grabbed by others.

Under the limited partnership scheme, Trilogy set up a separate entity — Trilogy Computer Development Partners Ltd. — to finance the development of a large IBM-compatible mainframe. The company offers individual investors a stake in the partnership in return for finance. No shares (known as units) would be sold to investors unless they were able to show substantial financial worth.

In the case of Trilogy, investors have to both have a net worth of at least \$100,000 after the purchase of the units and be willing to accept high risks, including possible loss of all their money.

(Continued on Page 119)

The 125% Solution: 50-Hour Week, 40 Hours' Pay

By Robert Batt

CW West Coast Bureau

SANTA CLARA, Calif. — Exhorting employees to work harder has become a routine gesture among companies hard hit by recession. When it actually becomes a requirement, however, people are inclined to sit up and take notice.

That is exactly what happened at Intel Corp. when top executives here recently announced what has become known as "the 125% solution." Reeling from a drastic slump in profitability during 1981, the company has begun demanding a 50-hour work week from its salaried employees, without any increase in salary.

For Intel's technical staff, data processing managers, engineers, marketing and senior executives, this means a 25% increase in their work week without compensation. But their reaction "has been pretty good," a company spokesman said. "No one is exactly dancing in the streets, but they understand why it is necessary and that the payoff is a stron-

ger company."

Altogether, 5,100 out of Intel's 17,000 employees will be affected by the plan.

The most compelling reason for this somewhat drastic measure is evident from a look at Intel's bottom line. In last year's third quarter, the company earned fairly healthy profits of \$25 million or 57 cents a share last year; in this year's third quarter, earnings slumped by more than half to \$11 million or 25 cents a share.

Product Releases

The company has introduced more than 70 new products so far this year, with 30 more slated to be released before the year end. Since these 70 products are expected to account for about 20% of fourth quarter earnings, Intel is keen to get its other new models out into the market as soon as possible.

"We are in the middle of a recession, profits are down and we need to have higher margins through our new products to lift earnings and help us compete," the Intel spokesman said.

Intel is emphasizing that its 125% solution is a radical departure from approaches taken by competitors like Texas Instruments, Inc., which earlier in the year announced layoffs and shorter work weeks in response to a slackening demand for semiconductors.

"We are consistently trying to do something different than our competitors," Roger Norby, director of personnel, explained. "When the recession ends, we do not want to have done anything which had an adverse strategic impact on our company."

Norby said reaction to the longer work week has been mixed, with particularly good results at Intel's Phoenix and Portland, Ore., plants. "Employee reactions have depended on how well the managers of each division or function have presented the plan. Where the managers have clearly understood the objective of the program, the employees have got enthused about it. But where the manager has come along and simply told people

(Continued on Page 112)

\$25 Billion in 1980

U.S. Hardware Exports Found Up

WASHINGTON, D.C. — U.S. manufacturers shipped \$25 billion worth of computer mainframe and peripheral hardware in 1980, up from approximately \$10 billion in 1976, according to latest government figures.

A recent statistical summary from the U.S. International Trade Commission (ITC) said \$18.6 billion worth of last year's shipments was

purchased by American users. The figures do not include the value of software, maintenance or contract service facilities associated with hardware consumption.

During that five-year period, hardware exports increased from approximately \$2.4 billion to \$7.5 billion, ITC said. The UK, West Germany, Canada, France and Japan were the largest for-

eign markets, accounting for about 46% of 1980 exports. Those countries were followed by the Netherlands, Italy and Australia.

In 1980, imports of mainframes and peripherals were valued at \$1.2 billion, up from the 1976 figure of \$525 million. According to ITC, Canada was the largest supplier of U.S. imports, followed by Japan.

Expansions

A multimillion dollar turn-key contract for an automated storage and retrieval system building has been awarded to Litton Unit Handling Systems by IBM. The new building, totaling 76,000 sq ft, will be constructed at IBM's University Research Park in Charlotte, N.C.

BDS Corp. has opened a new 20,000 sq-ft plant that

expands its capacity to 200 plug-compatible computer printing systems per month. It is located at the Bohannon Industrial Park, Menlo Park, Calif. 94025.

Computer Terminal Systems, Inc. will begin groundbreaking for its new headquarters and plant facility early this month in Hauppauge, N.Y. The company is planning to erect a 55,000 sq-ft structure on the 5.1-acre site.

Intel Staff Giving 125%

(Continued from Page 111)

you will be 'working X number of hours,' and not understood the philosophy, they have not been excited and it has shown up in the results so far."

Norby said the key to the program is to keep up the momentum. Every two weeks employees will be updated on how the program is going. It is initially forecast to last around six months.

"This is a hard-working company and a hard-working industry," Norby said. "At seven in the morning we are now seeing a lot of people here. They are not just sitting in their offices either. They are doing something which is going to improve their output. We are asking every division to accelerate their objectives toward introducing new products."

Intel said it regards the 125% solution as an acceleration measure rather than as an austerity device. It quoted, as an example, the recent introduction of its first computer system — the 86/330 — which is now selling at \$20,000. "Anything we can do to move up new product announcements like that will improve our margins," Norby pointed out.

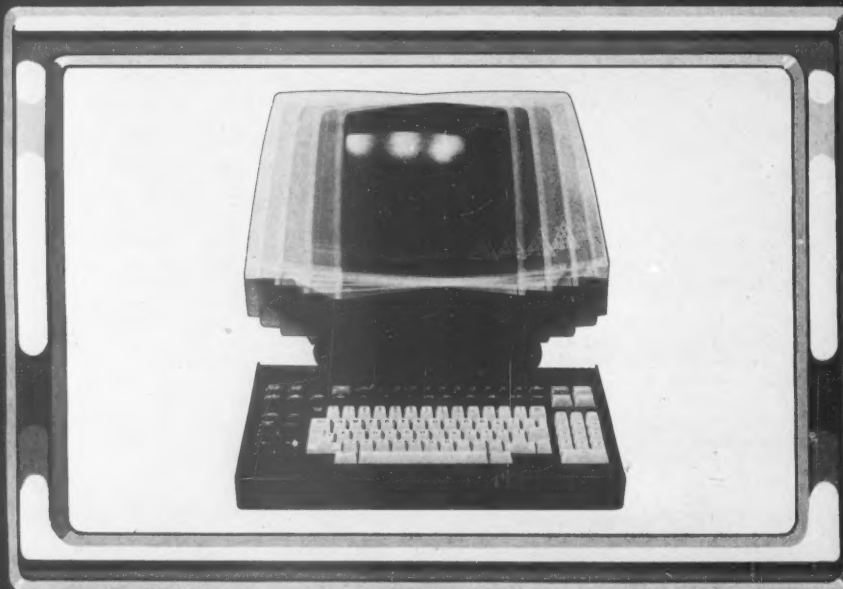
Intel's competitors have no plans to follow suit. TI reduced its work force earlier in the year by 2,800 — 3% of its number of total employees — and put its people on a four-day week. Full-time working has now resumed, except for the company's European operations, and TI said no further cutbacks are anticipated at present.

However, the company's recent annual report warned, "The prospect of a weakening U.S. economy and continuing flatness in the world semiconductor market clouds the near-term business outlook for TI."

As for Motorola, Inc., the company said the continuing emphasis would be on cutting costs, particularly administrative ones.

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New Software Firm's Strategy: Beat High Development Costs

By Marcia Blumenthal
CW Staff

BURLINGTON, Mass. — Beating the high cost of up-front software development is the key ingredient in the strategy of a new software marketing firm started here last spring by a co-founder of Incoterm Corp. and a former Software International Corp. executive.

Softmatics Corp. will begin a national marketing program for its Prisms distribution and manufacturing control system, targeted at medium-size users, during the first quarter of 1982. The company acquired from American Computer Sciences, Inc. the exclusive licensing rights to adapt the package for the IBM environment.

But finding the right product took several months. To aid in the search, Softmatics hired Culpepper and Associates, Inc., an Atlanta-based consulting firm that narrowed the product selection to 10 offerings.

Product Criteria

Softmatics had several criteria the product had to fit, explained President Patrick L. Shannon, formerly president of MRP Software International, Inc. The package had to be written in a high-level language, be an interactive system within the IBM environment and be a cross-industry package rather than a vertical package.

While Prisms was chosen for its general capability in the wholesaling and distribution industry, the system was originally designed by a cosmetic distributor's in-house development team to run on a Sperry Univac V77 minicomputer. Realizing the product was marketable, the parent company formed American Computer Sciences, which became an OEM for Univac.

There are a lot of spin-off companies like American Computer Sciences that have a marketable product but limited distribution expertise. Companies like that and small two- and three-person outfits will be the places where Softmatics will find its products, noted James F. Upton, the firm's chairman.

The partners in Softmatics, each of whom has a "substantial private investment in the firm," estimated there are about 5,000 software companies in the U.S., most of them with revenues of less than \$5 million and a scarcity of marketing resources.

Although Softmatics is primarily a marketing entity, it is not adverse to taking a proven product and adapting

it to another operating environment, Upton explained.

Upton was a cofounder, president and chief operating officer of Incoterm until the terminal firm was acquired by Honeywell in 1978. Today Upton lives on an island off the Maine coast and commutes to Burlington.

Upton estimated the total market for a Prisms-type

product at about \$110 million; he is aiming for a 15% share of that market during the next three years. Softmatics will pay the developer of the product on a royalty basis.

Right now Softmatics is in the process of adapting Prisms to the IBM System/38 environment. Because

(Continued on Page 114)



Patrick L. Shannon (left) and James F. Upton



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Executive Corner

• Wayne D. Brown has assumed the position of chairman of the board of directors at Comsat General Integrated Systems, a wholly owned subsidiary of Comsat General Corp.

• Robert M. Franklin has been appointed president and chief executive officer at Data Access Systems, Inc.

• The election of Roger Vallo as president of GTE Satellite Corp. was recently

announced, as was the appointment of Paul Stein to the newly created post of vice-president, manufacturing, for GTE communications products.

• Candle Corp. has named Martin Sprinzen vice-president of technical services for its computer service division.

• Dharam Ahuja has joined National Advanced Systems as vice-president of worldwide marketing.

• Scot Lamb has joined Grand American Computer Corp. as executive vice-president.

• Edwin Turney has been named executive vice-president of Micro Z Corp., in addition to being named to the board of directors earlier this year.

• Dr. Handel Jones has been appointed to the newly created post of staff vice-president, strategic manage-

ment, at Rockwell International Corp.'s Commercial Electronics Operations. Also at that company, Harvey Leva was named director of strategic management for telecommunications.

• Diana Roberts has been promoted to vice-president of finance and administration at Informatics, Inc.

• Norman Cameron Jr. has been recently appointed to the position of treasurer at

Mohawk Data Sciences.

• Paul Rusconi has joined Integral Data Systems, Inc. as vice-president of finance and administration.

• At Nixdorf Computer Corp., Rudolf Plauke has been named vice-president and general counsel.

• Dr. James Babcock has been appointed vice-president of research and development at Planning Research Corp.'s government information systems group.

Plan Attacks High Costs

(Continued from Page 113)

Prisms is an existing package, the development effort for the System/38 is compressed.

Rather than expend resources on development, Softmatics will invest heavily in documentation and support of the products it selects to market. Typically, software products developed by small firms have good technical documentation but lousy user documentation, Shannon explained. Softmatics now has two people involved in converting Prisms and one documentation specialist.

Easy Adaptation

Upton said that the beauty of the Softmatics approach to the packaged market is that it can adapt to state-of-the-art technology without a heavy investment. It is not tied to a particular product because it did not have a long-term investment in the original development of the product.

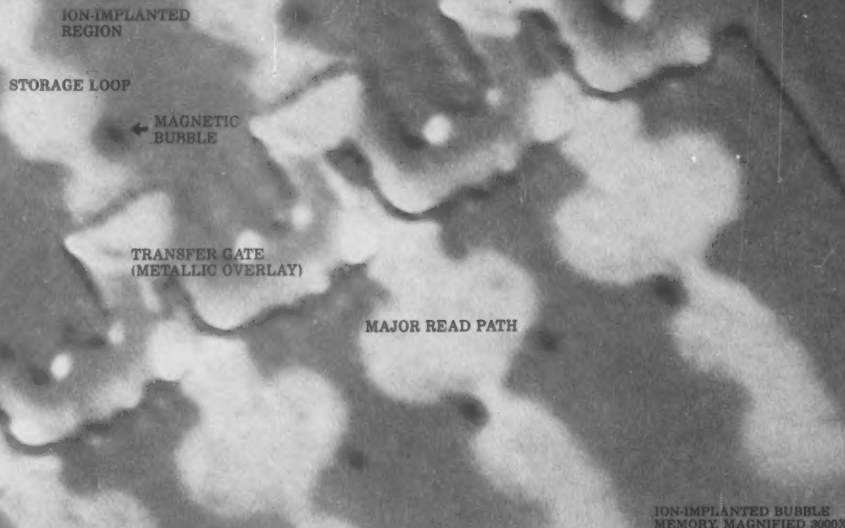
While the firm would continue to support the product for its users, it would not be locked in to any group of products.

Although that option exists, Softmatics appears committed to Prisms. At a later date, it will seek out products that can be used by Prisms users, such as a general ledger system.

The firm will start its national marketing effort in January. It is now bringing on board three marketing people and three more customer support specialists.



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- Method of growing epitaxial garnet films from a supercooled solution
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- Ion implant method of propagating bubbles
- Dual-conductor sheet method of propagating bubbles

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Limited Partnerships Emerging as Alternative

(Continued from Page 111)
agreed amount of return on their investment, ownership of the technology is transferred to the licensee, WBC.

The advantage of this arrangement to the partners is that they can get a multifold return on their original investment that can be accrued as long-term capital gains, and thus, taxed at a lower rate than other revenue. At the same time, the licensee retains 100% ownership of the company (which it does not under venture capital arrangements) and it obtains eventual ownership of the technology.

WBC has now broadened this arrangement and is offering to arrange limited partnership funding for other new companies and access to its distribution network in return for a 30% stake in those companies.

Such companies would need to possess product lines compatible with WBC products such as printers, disks, tape drives and memory modules. These vendors would sell their products to WBC, which, in turn, would market them on an OEM basis.

March sees this type of arrangement as the first in a

growing trend. "This is the way of the future. We have just broken the code on how to do it, but there are a lot of data processing professionals who are looking to take advantage of such an arrangement," he said. "The alternative is venture capital financing where the greatest percentage of [ownership] is not in the entrepreneur's hands."

Body and Soul

He added: "When venture capital guys finance a new company, they usually end up owning your body and soul. While they provide a

certain amount of capital, the price extracted is very high, and they provide very little in the way of leadership or marketing channels."

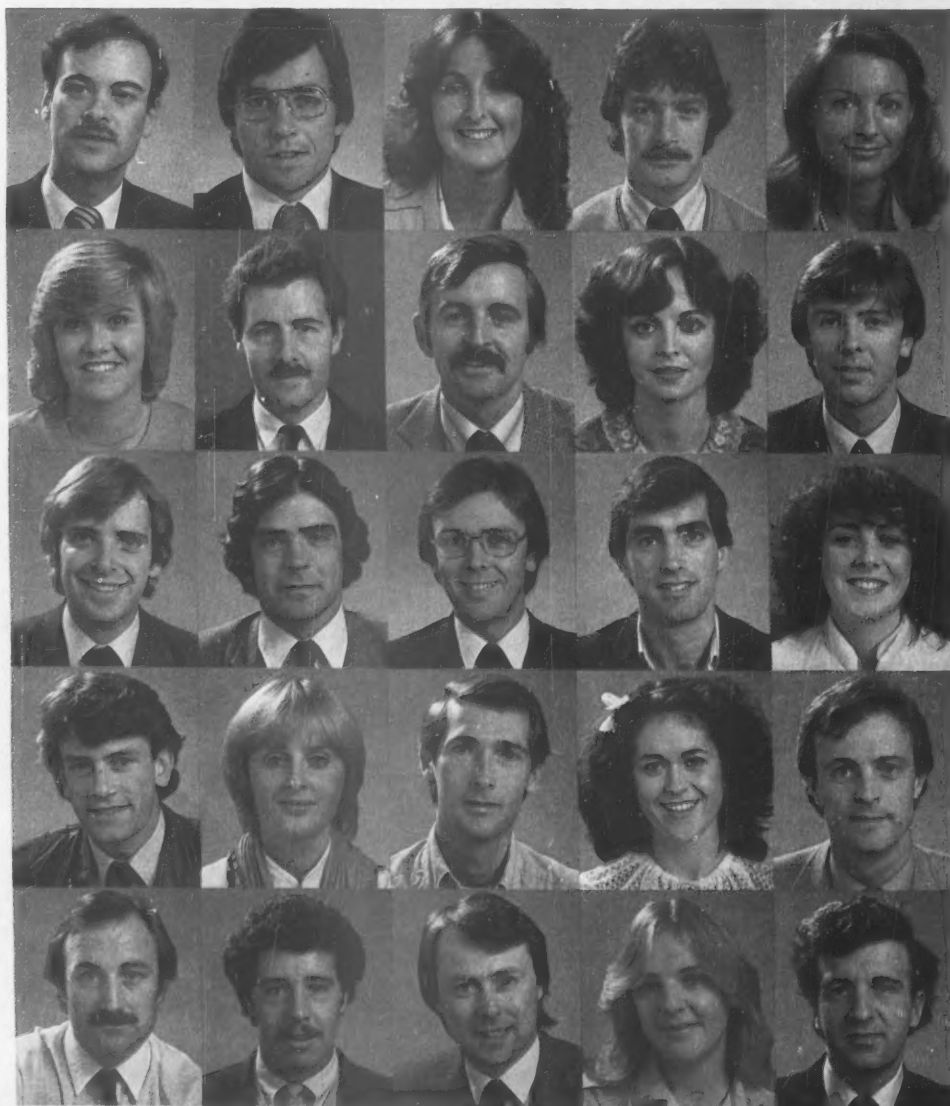
This view was echoed by another new company. International Applied Systems, Inc. (IAS), a Mountain View, Calif., manufacturer of high-performance color graphics display systems for IBM users. IAS has just completed its first round of financing — \$850,000 — via a limited partnership scheme. In total, the company is looking to acquire \$2 million in investments, which, it claims, will allow it to grow to \$50 mil-

lion within five years.

"We had a great deal of trouble trying to raise venture capital finance," Robert E. Peterson, IAS president, said. "A lot of venture capital firms didn't know anything about IBM and those that did weren't interested. They didn't feel our company could control its own destiny while operating under IBM's wing."

IAS, however, claims its products will complement IBM's products, rather than compete against them. As a result, it entered into a limited partnership with Bay Area investors.

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Honeywell To Lay Off 400 Workers

WALTHAM, Mass. — In a move that will lead to 400 layoffs, Honeywell, Inc. has announced it intends to close its Northboro, Mass., manufacturing operation around April 1.

Only about 50 members of the approximately 450-member work force will be retained at the partially owned, partially leased facilities plant, which is primarily engaged in terminal controller assembly and inspection and printed wire-board manufacturing.

Honeywell cited manufacturing inefficiencies at the operation as the reason for the plant's closing. The vacuum created by the Northboro shutdown will be filled by Honeywell's other facilities in nearby Brighton and Lawrence. Honeywell said it will help displaced workers by establishing a placement center designed to find them other jobs in the area.

Orders & Installations

Cray Research, Inc. has received a \$24 million order for a new computer system and an option for an additional system to be installed at the Los Alamos National Laboratory in New Mexico. The center already owns two Cray-1/S systems.

Planning Research Corp. Realty Systems will provide computerized real estate listing services and publish real estate listing books for three multiple-listing services and eight boards of realtors across the country. The deals combine to total more than \$10 million.

Northern Telecom, Inc. has been awarded a contract valued at approximately \$24 million by MCI Communications Corp. for the installation of computerized tandem-switching system 4000 switches and upgrading some of the company's existing switches.

Eastern Microwave, Inc. was selected by the Chemical Bank of New York City to provide two microwave systems to transmit data between the two Chemical Bank facilities.

United Transport has ordered a \$1.9 million Sperry Univac 1100/80 for automobile delivery processing, claims handling, payroll and general accounting functions.

New Companies

Wyse Technology, Inc. was formed in August to manufacture and market a new family of intelligent CRT terminals. The firm is located at 726 Charcot Ave., San Jose, Calif. 95131.

An international software marketing firm called Parameter Driven Software, Inc. has been established with headquarters at Suite 3820, 30800 Telegraph Road, Birmingham, Mich. 48010.

Starnet Corp., a company formed to provide satellite-based communications services, has established its headquarters at 3949 Ruffin Road, San Diego, Calif. 92123.

Advanced Distribution Control Systems has been formed to develop and market high-level, on-line distribution and manufacturing systems specifically designed for Sperry Univac's System

80, 90/25, 90/30, 90/40 and the 1100 series computer system. The company is located at 10400 Bunsen Way, Louisville, Ky. 40299.

Massachusetts Computer Corp. has been founded to design, manufacture, market and service computer systems for data acquisition using display-based interactive software. The company is located at 989 Main St., Acton,

Mass. 01720.

CSI-USA, the American representative of the European data processing organization of the same name, has announced the formation of a new operating division, GSI-CSS, to offer a full range of software consulting services.

It will be based at 65 Livingston Ave., Roseland, N.J. 07068.



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Allentown, PA	WFMZ	69	Sun	6:00 PM
Boston	WLVI	56	Sat	11:30 AM
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Trilogy, STC Blaze Trail In R&D Limited Partnerships

(Continued from Page 111)

Trilogy outlined the risks to investors in its prospectus announcing the setting up of a limited partnership. It said that among the major risks that prospective investors must be prepared to accept are "substantial and difficult technical problems in developing the advanced, very large-scale integrated [VLSI] semiconductor circuitry necessary for the success of the computer design."

It also asked potential investors to consider delays in the proposed computer system that may result in the need for additional partnership financing. It was the inability of Amdahl Corp. to stick to its initial production schedule that, some people say, placed the corporation at the mercy of its investors, most notably Fujitsu Ltd., the Japanese firm.

The prospectus also warned about "substantial competition in price, technology and otherwise from other computer manufacturers, including IBM."

It is this element of high risk that allows investors to include profits made on their investment as long-term capital gains. However, to Trilogy, this is incidental. "We look upon this scheme not as a tax shelter investment, but as a venture capital investment," Tom Lerone, Trilogy treasurer and financial controller, said.

Under the arrangement, the partners invest in the R&D partnership to finance development work of a large computer system. Once the technology has been developed, Trilogy has an option to acquire the license to the technology, and in return, the company will pay royalties to the partnership for products that incorporate that design.

If it so wishes, Trilogy can acquire a fully paid-up license in which it makes a lump sum payment of \$220 million. In lieu of cash, the partners can take up to 1.7 million shares in Trilogy.

Using this method, Amdahl was able to raise \$55 million to finance his project. Its major advantage over normal venture capital methods is that he already has the cash in hand. Venture capital is usually placed in stages.

"The company can concentrate on research and development of the product without having to worry about going back to investors for future funds. Because the money was already in place, it allowed us to go to institutional investors and raise a further \$30 million," Lerone said.

Trilogy is due to ship its first machines at the end of 1984.

Storage Technology Corp.

STC was the first major company to go into an R&D limited partnership in DP, following up on schemes that had already been set up in other sectors, such as oil exploration. As in the case of Trilogy, it set up a separate R&D entity for investors and required each investor to put down at least \$150,000.

STC has already been involved in two partnership schemes — the first for the development of a 2½- to 36 million instruction/sec large-scale mainframe, due to be shipped in ear-

ly 1984, the second for an optical disk. In the case of the mainframe, STC has the right to purchase the technology developed by the partnership while the partners accrue a percentage of the revenues derived from the sale of the computer for eight years. Thus the investors stand to make a seven- to eightfold return on their original investment of \$50 million. The optical disk scheme resulted in a \$40 million investment.

Under the arrangement, STC, which does not give any of its stock away to the limited partnership, has the right of first refusal on the technology developed. Only if it's refused the technology can the partners sell it to anyone else.

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Contracts & Pacts

International Memories, Inc. has signed a \$2 million contract with Bunker Ramo Corp. to supply 8-in. Winchester-disk drives for incorporation in Bunker Ramo products.

Altos Computer Systems, Inc. will sell 1000 systems/year to Moore Business Systems, Inc. in an on-going agreement. The deal is valued at more than \$10 million.

Condesin, Inc. has received a contract from Ebram, Ltd. to develop a 4 million bit memory chip.

Logicon, Inc. has received two contracts totaling more than \$3 million with options for an additional \$7 million from the Navy Regional

Contracting Office in Long Beach, Calif.

Science Applications, Inc.'s division called SAI Technology Co. has received a \$3.3 million contract from the U.S. Army Communications and Electronics Command for a quantity of 85 Model 2500 Plasmacope Display terminals.

Four-Phase Computer Systems, Inc. has received a \$12.8 million contract for the U.S. Air Force to supply distributed data processing systems.

Malibu Electronics Corp. has signed an agreement with Qi Corp. for delivery of up to 200 Dul-Mode 200 data processing/word processing printers per year for use with Qi's new microprocessor-based 6800C Series business computer system.

Alpha Microsystems, Inc. has entered into an agreement with Olivetti Corp. to supply Olivetti with central processing units and controllers that Olivetti will integrate into a new computer system they plan to introduce this fall.

Metroteller Systems, Inc. has signed a contract with Diebold, Inc. for its Tabs 9000 Series Total Automatic Banking Systems automatic teller machines.

A \$300,000 General Services Administration contract for interactive display terminals has gone to Imlac Corp., a Hazeltine Co.

Apple Computer, Inc. has purchased 35,000 copies of Personal Filing System, an information management program from Software Publishing Corp., for approximately \$3 million.

E-Systems, Inc. has received a \$78.3 million contract from the Federal Aviation Administration for its flight service automation system.

C3, Inc. has won a \$3 million contract from the U.S. Air Force for minicomputer systems in various domestic and international Air Force bases.

Nickels & Dimes

Amdahl Corp. has signed a new \$370 million multicurrency credit agreement with 12 international banks including Bank of America as agent.

Mergers & Acquisitions

The acquisition of Management Control Systems, Inc. by Informatics, Inc. was recently announced.

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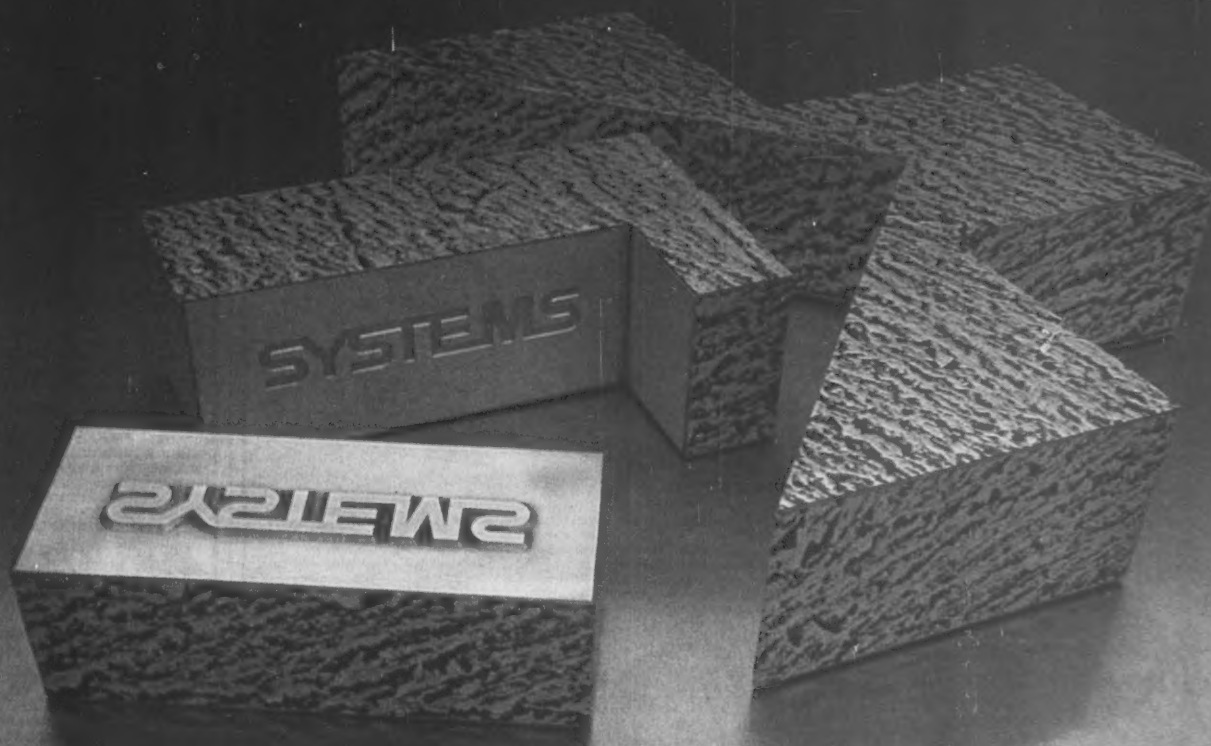
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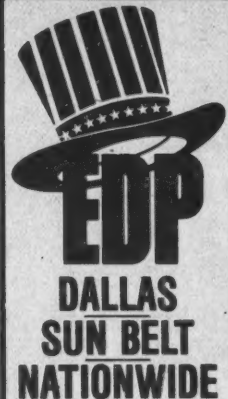
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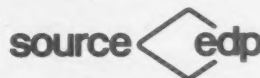
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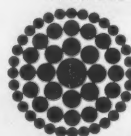
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Systems and Applications Programmer Analysts

Use latest concepts in software and systems evaluation to conduct product test definition, product specification and quality evaluation. Involves interactive business operating systems, CODASYL and TOTAL Data Base Management Systems. Software and systems quality assurance, and systems communication. BSCS plus 3 years experience and knowledge of user environments required.

Software Integration Analysts/Programmers

Perform functional specification review, test bed development, results monitoring and evaluation, and microcode integration. Develop tools for computer/firmware source object control systems. One project leader position. BSCS plus 2-5 years experience with assembly language programming, PASCAL/COBOL, microcode, and some application programming.

Interactive Systems Architects

Be a technical contributor in a senior level group tasked with defining the architecture for advanced transactional and interactive processing systems. Key areas include OS Kernel, performance modeling and BLSI based hardware in small to medium systems. BSCS/advanced degree preferred plus minimum 10 years business system experience.

Advanced Data Base Architects

Develop and demonstrate advanced Data Base Management technology, addressing long range requirements and next generation hardware. BSCS/MSCS level preferred with broad systems experience in building or using sophisticated data base systems, possess state-of-the-art awareness of technology and market trends.

Performance Measurement Analysts

Create and develop performance monitors and synthetic benchmarks, measure and analyze software systems performance. DBCS/BSEE and 1-3 years operating systems development experience required, plus performance measurement background preferred.

Firmware Systems Analysts

Design and implement firmware for next generation distributed/processing systems, includes work in micro programming, virtual machine evaluation, I/O processor/system console firmware interpreters, and VLSI-based systems. BSCS degree plus 1-3 years firmware design experience, assembly language programming, I/O, PASCAL or COBOL required.

Testware Development Analysts

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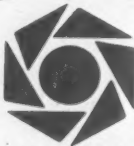
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The Joint Center for Graduate Study, located at Richland, Washington, at the confluence of the Columbia, Snake and Yakima Rivers is a multi-institutional educational center, administered jointly by the University of Washington and Washington State University with program participation by Oregon State University. The Center is seeking a resident faculty member to coordinate its graduate program in Computer Science, sponsored by Washington State University. Candidates must hold a Ph.D. degree in Computer Science or a related field. Opportunities are available for developing collaborative educational and research programs with the sponsoring universities through the DOE Research and Development Laboratories. Knowledge and experience in core areas such as data bases, software engineering or hardware/software specialties is preferred. Academic and industrial experience in research, teaching and administration are desirable.

The Joint Center for Graduate Study has sole use of a PRIME 750 virtual memory computer and access to the Computer Center located on campus at Washington State University in Pullman, Washington. The appointment level for the position will depend upon the qualifications of the applicant. Applications including three letters of reference and current curriculum vitae, should be addressed to Chairman, Computer Science Screening Committee, Joint Center for Graduate Study, 100 Sprout Road, Richland, WA 98362. Deadline for applications is February 1, 1982. An Equal Opportunity/Affirmative Action Employer.

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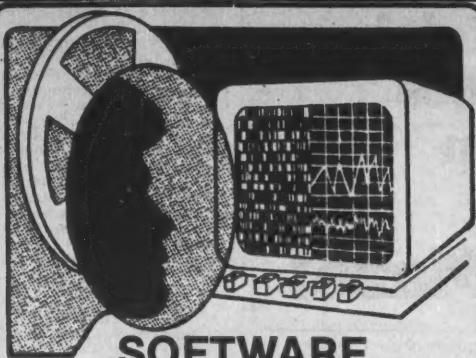
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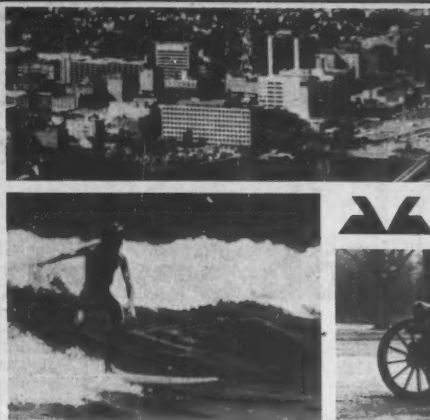
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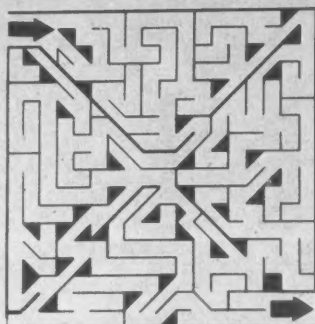
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Innovation at Amdahl is not new. Our philosophy of cross-training both software and hardware people is an industry first. In our Product Support and Services organization, you will be part of a spirited team of individuals who enjoy the opportunity to engineer their own careers. For more information, call Cindy Johnson, Field Manager, at 800-538-8460, extension 6866. In California, call (408) 746-6866. Or send your resume to Amdahl Corporation, Dept. 259, Mail Stop 300, 1250 East Arques Avenue, Sunnyvale, California 94086. We are an equal opportunity employer through affirmative action.

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Dr. Abdelaziz M. I-Sagoff (Box 128)
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Address replies to Dr. R. Gene Golder, Director, Information Science Program, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132. Equal Opportunity/Affirmative Action Employer.

Closing Date For Applications: Dec. 18, 1981

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37.5 hours per week at \$312.50 per week salary. Develop and maintain computer systems performance, applications programs in accounting systems, and data bases and DEC PDP-11 computer systems. Requires MS degree in Computer Science. Education to include knowledge of DEC PDP-11 computer systems software and hardware. Please send resume to: Mrs. Shirley Chafin, Illinois Job Service, 910 South Michigan Avenue, Room 400, Chicago, IL 60605, Reference #8436-S.

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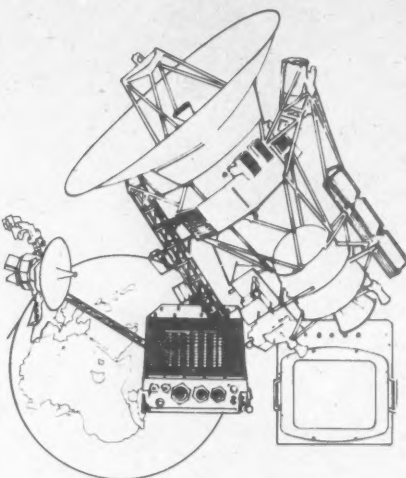
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CICS Systems Programmer positions require solid experience with CICS Internals (MARCO & COMMAND levels). Will involve tuning and performance analysis, and the development, maintenance, modification and implementation of related software.

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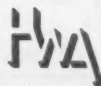
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This position requires three to five years' experience preparing Feasibilities, Analysis and Design, Programming and implementing of Scientific/Engineering Data Processing projects. Environment will be IBM 4331 DOS/VSE, CICS, POWER, COBOL, FORTRAN, ALC, RPG, ICCF and CDC, CYBER, RBT. A degree in Computer Science, Math or Engineering or related area is desirable. The ability to understand engineering problems and formulas and program in FORTRAN is necessary.

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This position requires a minimum of three to five years of proven experience and initiative in designing, developing, implementing and maintaining data processing systems for business applications. A BS in Computer Science or Business Administration is preferred.

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At the instructor or assistant professor level depending upon qualifications. Training must be a minimum of a master's degree in data processing or related area or Baccalaureate degree plus 5 years related work experience in the instructional area. College transcript required. Salary negotiable. Applications withing Cleveland State Community College application forms must be received on or before November 23, 1981. Contact Personnel Office P.O. Box 3570 Cleveland State Community College, Cleveland, Tennessee 37311. Equal Opportunity Employer M/F.

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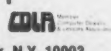
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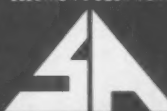
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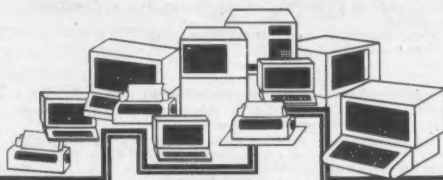
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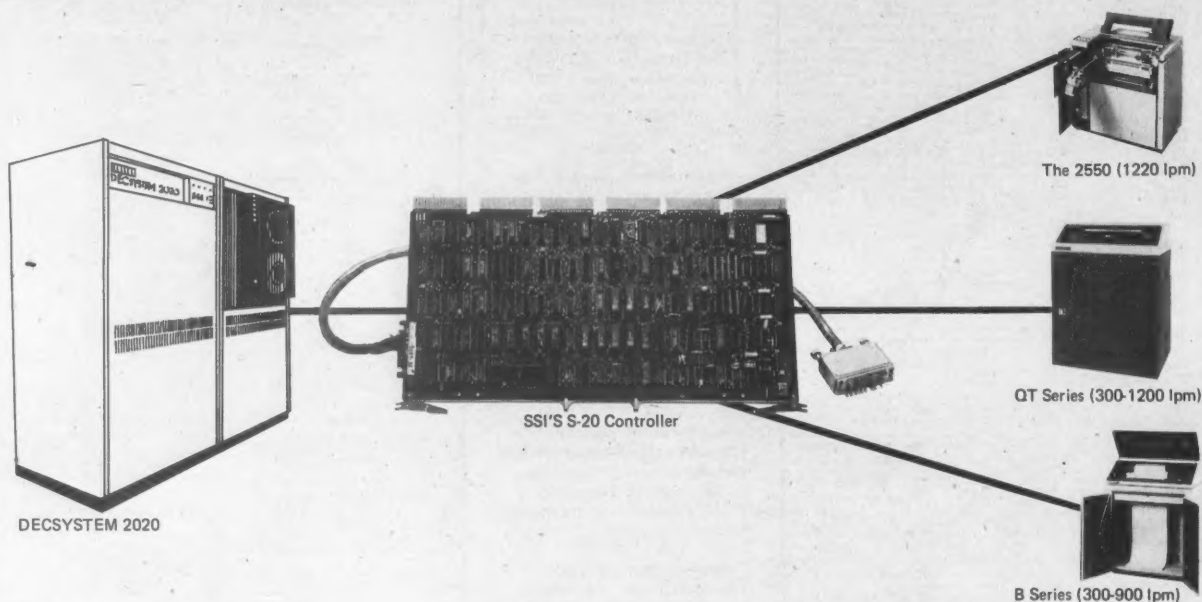
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